metric measures

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metric measures

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Modular Coordination in Building Industry

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THE reduction of the cost of building construction has been a challenge for decades. This challenge has been met to a great extent by 'modular coordination' of dimensions in the building industry. The concept of modular coordination has become a potent tool for higher productivity in the building industry.

Modular coordination is achieved by the establishment of a common denominator or 'module' for the sizing of components, which reduces production costs of materials by reduction in the variety of building components and lessens building costs by elimination of unnecessary on-site modifications. By simplification and rationalization of dimensioning and detailing, drawing office costs are also reduced.

Modular coordination utilizes the qualities, quantities and economies flowing from mass production. It is a system of prefabrication and interchangeability of parts which minimizes the amount of high-salaried, skilled labour needed for assembly purposes at the building site. The industrially produced building parts must, however, fit into each other on the building site. They must be so made that they can be fitted in a number of different combinations so as to allow freedom for creative architecture. Factory made units must be fitted into a general dimensional system with a common denominator—the basic module. The object of modular coordination is, therefore, to allow advanced standardization and industrialization of the production of building parts, and secondly to remove their production from the unfavourable building site conditions, to suitable factories, where conditions are more suitable for rational production. That is why modular coordination is basically an industrial tool.

Historical Survey

Fred Heath, an engineer experienced in masonry products, originated in 1925 the idea of coordinating building materials through the use of a 4 inch grid.

Later on, Albert F. Bemis, a manufacturer whose hobby was the study of housing, broadened the basis of the concept by introducing the 4 inch cube. According to his theory, any building could be made up of a series of the basic 4-inch cubes or its multiples and no waste would result if the construction materials were standardized on the basis of the 4 inch multiple and if architects' plans were dimensioned to correspond with it.

After Mr. Bemis died in 1936, his successors formed the Modular Service Association at

the suggestion of the American Standards Association (ASA).

In 1938 the ASA set up Project A-62, for 'the coordinating of dimensions of building materials and equipment'. In 1941 the ASA published a pamphlet, ASA Project A-62, presenting the four-inch cubical module, as a basis for investigation and trial. On September 14, 1945, the ASA formally approved the 4 inch module as an American standard unit suitable for dimensional coordination.

The idea of modular coordination gained ground in the USA, and many Associations connected with housing and buildings supported it. The concept appealed to engineers outside the USA and in a short while a number of countries took it up.

Ultimately, after considerable study in both the metric and non-metric countries, responsible organisations in each of the participating countries contracted with the European Productivity Agency to proceed with the work. The British Standards Institution was designated as the technical secretariat. The result of the theoretical work was the publication of 'Modular Coordination in Building', Project No. 174, by the European Productivity Agency in August 1956.

The Module

The module is a unit of size internationally agreed upon for the coordination of dimensions. The size recommended is 10 cm where the metric system is used and 4 inches where the foot-pound system is used. The module may be applied to width, depth or height of any material or the building itself as a whole.

The module has three distinct functions:

(1) It is the basic modular size.

(2) It simplifies and interrelates component sizes.

(3) It is also the basic increment of size in the modular reference system.

In designs based on this system, components which are based on the module or its multiples would be used for all purposes. So the basic increment of size in planning and component manufacture would be identical. The particular components selected by the architects could then be easily fitted and simply related to individual design. In this way coordination between standard industrial supply and individual design demand would be assured.

The 10 cm basic module is the most convenient basis for standardization of building products because:

(1) It is large enough for manufacturers to turn out a reduced number of stock sizes and still satisfy consumer demand.

(2) It is small enough to allow ample freedom and flexibility in architectural design and equipment layout.

Modular System of Tolerances

The modular dimension of a component includes the dimension of the component as well as its joint. To achieve it in practice, a modular system of tolerances has been devised, on the basis of engineering conventions for limits and fits.

In evolving this system, it has been kept in mind that components have to be dimensioned for manufacture even before their actual positions in any building are known. All dimensions are, therefore, related to modular planes and not to adjoining components.

Modular plane is the reference plane in a modular reference system.

The minimum deviation is the smallest allowable gap between a component and the modular plane (for erection, it is convenient to assume a gap equal to half the deviation on each side of the component between it and two modular planes) taking into account the need for jointing material, if any.

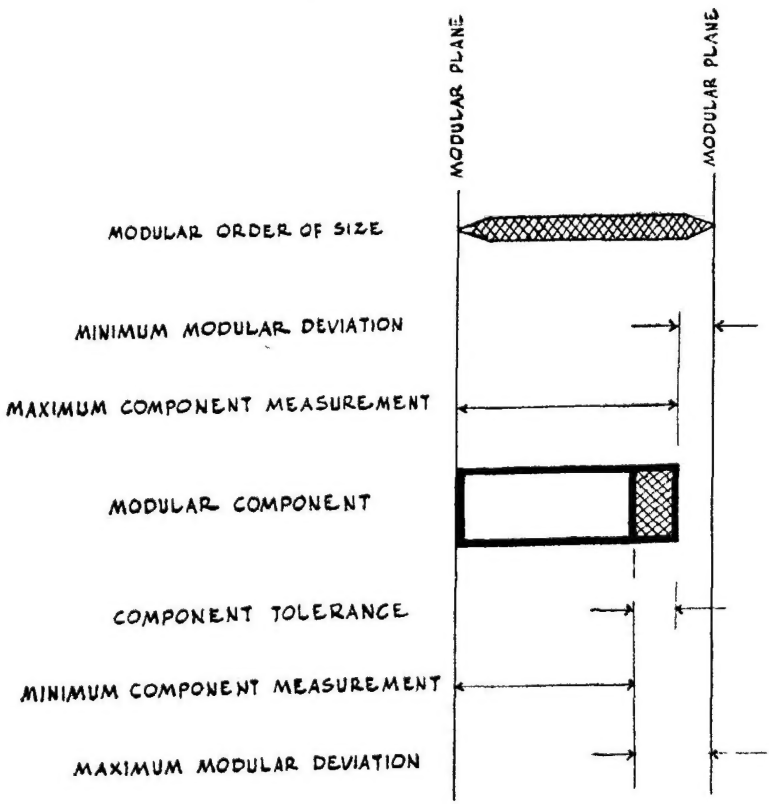
The maximum component measurement is the difference between the modular size and the minimum deviation. Any component larger than this should be rejected in the factory by quality control.

The maximum deviation is the largest allowable gap between a component and the modular plane.

The minimum component measurement is the difference between the modular size and the maximum modular deviation. Any component smaller than this should be rejected.

The component tolerance is the difference between the maximum and minimum component measurements which is the same as that between the minimum and maximum modular deviations.

These tolerances are shown in Fig. 1.



MODULAR SYSTEM OF TOLERANCES

FIG. 1.

Definition of Terms

Term	*Definition*
Dimensional coordination:	Coordination of dimensions to enable components to be used together in a building without modification.
Modular coordination:	Dimensional coordination using a module.
Module:	The common unit of measure particularly specified for dimensional coordination.
Basic module:	A fundamental module whose value is fixed to coordinate the sizes of components with the greatest flexibility and convenience. The basic module adopted is 10 cm.
Modular reference system:	A reference system in which a module is used.
Planning module:	A dimension which is a multiple of the basic module used in the preparation of designs for buildings. The planning module adopted by the Indian Standards Institution is 100 cm.
Modular dimension:	A dimension which is a multiple of the basic module.
Modulated dimension:	Dimension fixed on a modular basis which is not necessarily a modular dimension.
Work dimension:	A dimension specified or set out on a drawing against which the actual measurement of the finished work may be compared.
Nominal dimension:	The dimension by which a component is designated for convenience.
Actual dimension	Dimension of a unit or component taken after completion by direct measurement. This is equal to work dimension ±tolerance.

Application in Design of Buildings

All buildings should be so dimensioned that walls, floors, openings in walls and floors, placing of equipment, pipe connections, etc., are coordinated by an imaginary modular square grid laid over plans, elevations and sections.

Horizontally, in the case of walls whose nominal thickness is a multiple of the module, the modular grid should be laid so as to coincide with the modular surface of the unfinished wall. In the case of walls whose nominal thickness is not a multiple of the module, the grid should be so laid as to coincide with the central lines of the walls. Partitions of non-modular dimensions should be placed on a centre line basis so as not to disturb the grid arrangement. Doors, windows and other openings should be located so as to fit into the modular reference system.

In the vertical plane, the modular grid should be so laid as to coincide with the modular surface of the structural floors, finishing not being taken into consideration. The height of the storey, measured from floor to floor should be modular. In the placing of doors and similar openings, a clearance of 4 cm for floor finishing should be provided and the height of shutters adjusted accordingly. Sills, lintels, ventilators, etc., should be placed so as to fit into the modular grid.

Advantages of Modular Coordination

(1) To the architect

Modular coordination is a boon to architects as it simplifies architectural design and

reduces drafting time which the architect can gainfully employ in creative architecture and better planning of services. One example will illustrate this point. In an office in which a number of school buildings based on the use of steel frames were being designed, 114 sheets of drawings were found to be needed for the steel work for the first school. When a modular scheme has been developed, it was found that 33 sheets of drawings of component parts were necessary, following which each school required only one general layout drawing, so that 41 sheets of steel work drawings were adequate for eight schools although these varied considerably in layout. It appears probable, therefore, that when a modular system is adopted and is used by drawing-office staff, the preparation of plans and working drawings would be much simplified. It would no longer be necessary fully to dimension such drawings, since the use of the grid would indicate sizes of, and often the position of, the various components.

It would permit easier substitution of alternative materials and changes in specifications without replanning.

(2) To the Contractor

If the modular system is used the coordination of materials and components results in quicker, easier and accurate quantity surveying, because modular coordination eliminates the necessity of preliminary interpretation of each architect's individual system. It ensures easier and more economical field erection with a reduction in field cutting and consequent reduction in damage to materials and components.

Modular coordination holds waste of materials to a minimum by reducing (*i*) cost of purchase (*ii*) cost of labour used in cutting off the waste materials and (*iii*) the cost of disposing waste. Cutting and patching are greatly diminished. Saw time on facing materials is reduced almost a 50 per cent. Squeezing and stretching of mortar joints would not be required and engineering layout time would be easily reduced by 35 per cent. The rate of actual laying is definitely increased. It increases productivity of labour.

To the contractor, it means more efficient methods on the job and less construction time, with consequent lower cost.

(3) To the manufacturer

It provides a rational basis for the standardization of building material sizes on a national rather than a regional or local basis. In the coordination of sizes of building materials, the grid provides a guide to the manufacturers in determining the sizes of their products. Manufacturers are able to reduce the number of stock sizes of building products and still satisfy consumer demand for flexibility.

The introduction of new designs and standards would be easier and manufacturers would know that such modifications would fit into existing plans or future requirements.

It simplifies manufacturing process since they do not have so many sizes to make.

To the manufacturer, it results in reduced warehouse space, reduced packaging costs and better size and quality control.

Modular Coordination in India

The Indian building industry which is on the threshold of immense expansion is in a unique position to adopt the technique of modular coordination which is a very potent tool for higher productivity in the building industry. This has already been realized in India and considerable work on the standardization of building products based on modular coordination has been

done by the Indian Standards Institution. It is expected that as the programme for the adoption of the metric system in the building industry gets into full swing in a year or two, the field application of modular coordination would become a reality.

A few examples of Indian Standard sizes of various components would show the range of the coverage of the work of the Indian Standards Institution. It is expected that most of the components would be standardized shortly and codes for their utilization laid down.

DIMENSIONS OF PRINCIPAL BUILDING MATERIALS

Type of Material	*Modular Dimensions*	*Work Dimensions*
Building bricks	20×10×10 cm	19×9×9 cm
(IS: 1077—1957)	20×10×5 cm	19×9×4 cm
Stones	20×20×20 cm	19×19×19 cm
(IS: 1127—1957 and	40×20 or	39×19 or
IS: 1128—1957)	30×20 or	29×19 or
	30 cm	29 cm
	150×150×5 cm	149·5×149 5 ×5 cm
Tiles	20×20 cm	19·85×19·85 cm
(IS: 1237—1959)	30×30 cm	29·85×29·85 cm
Metal doors and windows . ..	210×60 cm	207·5×57·5 cm
(IS: 1033—1957)	90×60 cm	87·5×57·5 cm
Timber doors and windows .	190×80 cm	187·5×77·5 cm
(IS: 1003—1957)	210×90 cm	207·5×87·5 cm

Conclusion

It is now clear that modular coordination plays a vital role in building productivity and reduction in building costs. In the context of Five-year Plans, when large sums are being spent on building construction, the economies achieved by employing this technique will be significant. In the meantime, a vigorous programme of the application of the concept of modular co-ordination is needed. A vigorous campaign to popularize modular coordination is essential. An Indian Modular Society should be formed on the pattern of British Modular Society with the collaboration of National Buildings Organisation, Indian Standards Institution, National Productivity Council, Builder's Association of India and the Indian Manufacturers' Association. This Society should propagate the concept of modular coordination. Lecture courses should be arranged, popular literature published on the subject and engineering institutions asked to incorporate it in the syllabus for architecture. It will also be helpful if in the proposed 'Building Centre' of the National Buildings Organisation, a small block, planned on modular system and constructed with modular materials, is built. In this block, the plans and the entire data regarding construction should be exhibited for the reference of architects, builders, engineers and manufacturers.

Metric System in French Usage

GUY KNOCHE

French Economic and Technical Bulletin,
France

PART I—TEXTILE INDUSTRY

IN the chapter entitled 'Industrie textile', the French 'Annuaire de Statistique Industrielle' gives a list of the various textiles products in *tonnes* (1,000 kilogram), whether they be yarn or woven fabrics. Such statistics are drawn up for the sake of unification and facilitate comparisons of production figures of different textiles.

This simplification, however, is the result of intricate calculations, for at the source statistics covering various textile products are supplied in a somewhat diversified form, fairly often in metres but, particularly where fabrics are concerned in square metres, as widths differ according to quality.

Count of Yarn

At the spinning stage, the fineness of yarns is usually identified by a number called the count.

For cotton yarns (supplied to weavers in bobbins of several thousand metres), the count is equal to the number of thousand metres (kilometres) of the yarn contained in a weight of 500 grams. Thus, a number 5 yarn means a yarn 5,000 metres (or 5 kilometres) of which are contained in 500 grams.

For woollen yarns the numbering is derived from a similar principle. In this case, however, the count represents the number of thousand metres (kilometres) of the yarn contained in one kilogram.

For hemp and jute, the unit of length for yarns is the lea, or 'echevette'. A lea consists of 274 metres (300 yards) of yarn.

For natural silk, the international standard adopted by France to facilitate commercial transactions is the Italian numbering system: the count indicates the weight in half-decigrams (0.05 gram) of 450 metres of yarn (or decigrams per 900 metres of yarn). This also applies, by analogy, to artificial fibres.

Woven Fabrics

In woven fabrics, the width of the pieces is rather important. The length of fabrics is variable and depends primarily on transportation facilities. For cotton fabrics the maximum width is 120 centimetres (1.20 metre). It corresponds to the description 4/4. On this basis, the so-called 3/4 fabric has a width of 90 centimetres. The current width for woollen fabrics is 140 centimetres (1.40 metres). Other fabrics whose woven width is 80 centimetres are also used.

The goods sold by the manufacturer to a wholesaler are later cut at the retailer's and sold to customers in lengths corresponding to various uses.

For instance, a man's three piece suit (jacket, waistcoat and trousers) generally requires 3.50 metres of material, the width being 140 centimetres. For a woman's suit (jacket and skirt), size 44, 3.20 metres of material are needed if the width is 90 cm but only 1.95 metres if the width is 140 centimetres.

The textile industry is extremely diversified and measurements are dependent on the final use. The only measuring units used are those of the metric system—the metre and its most usual submultiple, the centimetre.

PART 2—DAIRY INDUSTRY

France produces an average of 200 million hectolitres (*i.e.* 20,000,000 litres) of cow's milk per annum, which represents an annual average of 2,000 litres per animal. This means that, dealing with a liquid product, dairy statistics must necessarily use units of capacity, the litre, or where a statement in litres would call for very high numbers, the hectolitre. The same units are used for measuring sheep's and goat's milk.

Sale of Ordinary Milk

Milk, when sold to consumers in its original form (but, of course, after necessary processing to ensure that the product supplied is free from harmful germs) is delivered in terms of the litre. The retailer, who receives the milk in 10 or 20 litre cans, sells it in retail per litre or fraction of a litre. For this he uses a number of small cylindrical containers.

But this form of sale, formerly very prevalent, is now being rapidly replaced by more modern methods. Milk is being sold in pre-packed form. The simplest is the bottle (socalled on account of its shape) containing either one litre or half a litre. These bottles contain pasteurized milk. They are sealed in the factory so that no handling is required on the part of the retailer. Recently, specially processed cardboard containers have appeared on the market; they are pyramidal in shape, which facilitates their stacking and transportation. These cartons contain a half-litre or one litre.

Thus, for the sale of ordinary milk, the litre is the only unit used, either directly or through one of its submultiples. As the litre is practically equivalent to one cubic decimetre (or 1, 000 cubic centimetres), the half-litre corresponds to 500 cubic centimetres and so on.

Sale of Other Forms of Milk

Modern technology has enabled milk to be marketed in forms other than its original State, *e.g.* as evaporated and condensed milk (sweetened or unsweetened) and dried milk.

Evaporated or plain condensed milk (which is milk from which part of its natural water content has been removed) is sold in cylindrical tin-plate cans with a sealed lid, thus ensuring perfect conservation. The unit for sale is then no longer that of capacity, but of weight the gram. The unsweetened condensed milk content of cans is expressed by its net weight (*i.e.* not including the weight of the can itself). The net weight of milk in such cans is 170 or 410 grams.

This is also true of sweetened condensed milk which is sold either in cans or in tubes. In cans the net weight is 400 grams, and in tubes (of which two sizes exist) 175 and 330 grams.

Finally, dried milk is sold in various forms and in cans of different contents. The quantity of milk contained in the can is expressed by its net weight, -one kilogram, five hundred grams, etc.

Sale of Butter and Cheese

About one-third of the milk produced in France is used for making butter. The butter manufactured in creameries is marketed in two forms—blocks weighing 10 kilograms which the retailer divides up into submultiples of the kilogram, *i.e.* 500 grams, 250 grams, or in packets in the shape of oblong paralleli-pipeds, the net weight of butter which corresponds to the submultiples.

So far as cheese is concerned the situation is more complicated. As the foremost cheese producer in the world, France makes several hundred varieties which are distinguished not only by the region where they are produced and their taste, but also by their form which extends, for instance, from that of the Comte gruyere in the shape of solid wheels weighing 35 to 50 kilograms, and measuring 40 to 70 centimetres in diameter and 8 to 13 centimetres in thickness, to the small goat's milk cheese weighing barely 100 grams. Simplification is, therefore, necessary in the retail trade: fairly small cheeses are sold by the piece, while others are sold by weight. The customer, for instance buys a '*camembert*' but 200 *grams* of gruyere.

Finally, certain special dairy products are sold in different forms. One of them is yoghurt, sold in pots containing 125 cm^3 (small size) or 250 cm^3 (large size). Other soft uncured cheeses are sold in boxes containing two, three or six items.

PART 3—LAND MEASURES

The area of France is about 5,50,000 square kilometres. To measure such vast areas, the square kilometre is obviously the most appropriate unit. But it is a unit which represents a large area and is, for example, too large a unit to be easily used in agriculture. If it was applied, very small fractions of the square kilometre would necessarily have to be used which would lead to great inconvenience.

Consider, for instance, that the average area of a French farm is 0·142 square kilometre, of which the plough-land is 0·047 square kilometre, of which again 0·0217 square kilometre is reserved for growing cereals, etc. This becomes more and more complicated.

Another suitable unit was, therefore, evolved. This unit which is reserved for agriculture, and fits perfectly into the body of the metric units, is the *are*, which is equal to 100 square metres and has a multiple, the *hectare* (100 ares, or 10,000 square metres), and a submultiple, the *centiare* (1/100th of an are, or 1 square metre). It should be noted that the submultiple and multiple are expressed by means of the usual prefixes: hecto = 100 times more; centi = 100 times less (*e.g.* hecto = 100 litres; centimetre = 1/100 metre).

Thanks to these agrarian units, calculations relating to agricultural areas become extraordinarily simple. In the example given earlier, the average area of a farm is 14·2 hectares, the area of the plough-land is 4·7 hectares and that devoted to cereal cultivation is 2·17 hectares. The second figure after the decimal point, representing centiares, that is to say square metres, is of sufficient precision for the usual measurements.

This precision, is necessary because a farm, even of about average size, very seldom consists of a single piece of land. It is often made up of several pieces separated from one another by variable distances. In one village, for instance, each farmer may own a certain number of fields distributed over its whole extent and more particularly suitable for growing wheat, beets, grapes,

etc. In this way mixed farming is instituted, which necessitates a fairly accurate evaluation of the different areas to within one square metre and this can be done by using the centiare as a unit.

How are these areas measured? The various holdings, in a commune are shown on a general plan of the commune—the 'cadastre' or land register—where each landowner can see exactly where his piece of land ends and where his neighbour's begins. This plan was drawn up on the basis of accurate measurements made on the site by specialists called 'arpenteur' (surveyors). The term 'arpenteur' comes from the noun 'arpent', a land measure of old-time France used before the metric system. Its value varied according to the region from 42 to 51 ares. To measure land these 'arpenteurs' or surveyors use a 'chaine d'arpenteur', which is a surveyor's chain consisting of 10 jointed links in the shape of bars joined to one another, each measuring one metre. Thus, the surveyor's chain is 10 metres long, and a square, the four sides of which could be measured in one operation, would have 10 metres sides and an area of 100 square metres, which is exactly the definition of the are.

The yields of cultivated plants are usually measured in quintals per hectare, the quintal (100 kilograms) being the unit adopted in agriculture for the expression of weight.

Metric Arithmetic in Schools

THE metric system of weights and measures is now being used in progressively larger areas in the country in the commercial and industrial fields. In fact, the compulsion to use only metric weights and none other has become effective all over India from April 1962. Since then resort to weights other than metric has exposed the user to prosecution and punishment. Similar compulsion to use length measures will start from October 1962, and for capacity measures from April 1963. Thus by April 1963, all commercial transactions would have to be carried out using metric units.

The use of weights and measures affects everyone of us throughout life in one way or another. Every day we enter into many small transactions in which calculations of money and weights or measures have to be carried out. We are able to do these quickly because of our knowledge of arithmetic. If the system of coinage and weights changes, we have to relearn the mode of calculations in the new system. This process of relearning had to be practised in India of just ten years ago as one travelled from North to South or East to West, because there were numerous systems of weights and measures prevalent in the country. Adults had perforce to do it. What was worse was that children had to learn many of these by heart; it is little wonder that many of them developed distaste for arithmetic.

Facilities of Calculations

One of the important reasons for the adoption of the metric system was the

facility of calculations, particularly in conjunction with decimal coinage. It has been proved in Western countries that considerable time in schools is saved, if arithmetic is taught in the decimal system. Some estimates go even as high as to claim a saving of 20 percent of the student's time. Even if such an estimate may be too high, there is no doubt that the saving of time is substantial.

Now that the metric system is being used in ever larger fields in everyday life, there is no reason for the arithmetic education of children to continue in terms of the old weights and measures, most of which would be going out of use within a year's time. It is necessary to revise thoroughly the curriculum for school arithmetic and rewrite the textbooks, so that only the metric system is taught right from the lowest to the highest class (*i.e.* I-XI). The British system, being an international system, may be taught for the sake of additional knowledge in the last few years of the student's school career.

Past Efforts

After about four years of work, it may now be said that the replacement of old weights and measures and coinage by the metric system and decimal coinage in school arithmetic is not far off.

As is well known, the introduction of metric weights was begun in India in selected areas from October 1958 and their use became compulsory in these areas from October 1960. Simultaneously the Education Departments of the States were also advised to add an additional chapter to the present arithmetic textbooks to acquaint the students with the essentials of the metric system and its calculations.

The Government of India on its part prepared a 'Manual for Teachers' and supplied it to the State Governments and educational institutions about 4 years ago. This was used by many authors to write additional chapters on the metric system.

It was intended that when the adoption of the metric system was taken up on a national scale, the textbooks could be drastically revised to reflect the 'metric atmosphere' in the country. The State Governments were informed to alter the curriculum and rewrite textbooks.

The process of alteration was, however, very slow and the change in the country's coinage and weights and measures has not yet been fully reflected in school education. In most textbooks an additional chapter was added to introduce the metric system and a few examples set. The use of seers and maunds, pounds and ounces, visses and palams and annas and pies went on. The metric system was merely an additional system to be learnt and was a new burden for the children.

There were many reasons for this state of affairs. One school of thought maintained that as long as old weights and measures and coinage were in use or were to be seen in the bazaars, the teaching of arithmetic should lay due emphasis on them. Others felt that there were too frequent changes in textbooks. Whatever the reasons, the net result was that the teaching of metric system was not given its due place.

Survey of Textbooks

A quick factual survey was recently carried out by the Ministry of Commerce and Industry to ascertain how far the new coinage and the metric system of weights and measures had come into use in school textbooks in arithmetic. The situation in States and Union territories was as shown below:

(1) *Andhra Pradesh*

New coinage was predominantly used in exercises. There were special chapters on the metric system. About 10 to 40 percent of the exercises used the metric system. Books were to be revised in 1962-63.

(2) *Assam*

The use of the metric system and the new coinage in textbooks was negligible. There were descriptive chapters on the new coinage, but in exercises, values were mainly specified in rupees, annas and pies.

(3) *Bihar*

Only old coinage was used in books for classes upto VII. In books for classes VIII and IX, about 40 percent of the exercises used new coinage. There were separate Chapters on the metric system, but no use was made of the metric system in exercises.

(4) *Delhi*

New Coinage was almost exclusively used in exercises. Separate chapters on the metric system were included in most of the books. Metric weights and measures were used in 20 to 50 percent of exercises.

(5) *Gujerat*

Old coinage and old weights and measures were used almost exclusively in exercises. A few books contained separate chapters on the metric system.

(6) *Himachal Pradesh*

Both old and new coinage were used. There were seperate chapters on the metric system. About 10 to 50 percent of exercises used the metric system.

(7) *Kerala*

New coinage was used predominantly in exercises. There were chapters on the metric system, but exercises in the old systems were mainly used. A small proportion of exercises estimated at 10 to 20 percent used the metric system. Books were to be revised in 1962-63.

(8) *Madhya Pradesh*

Very little use was made of either the new coinage or new weights and measures. Books were to be revised in 1962-63.

(9) *Madras*

New coinage was used predominantly in exercises. There were special chapters devoted to the metric system. The metric system was used in a proportion of the exercises, ranging from 5 to 20 percent.

(10) *Maharashtra*

Very little use was made even of the new coinage, not to speak of weights and measures. No use was made of metric weights and measures in exercises. There were separate chapters devoted to the metric system in some books.

(11) *Mysore*

New coinage was used predominantly in exercises. There were separate chapters on the metric system. Metric weights and measures were used in 10 to 15 percent exercises. Books were to be revised in 1962-63.

(12) *Orissa*

Both the old and the new coinage found place in exercises. A small proportion of exercises, roughly estimated at 5 percent, used metric weights and measures.

(13) *Punjab*

Both old and new coinage were used in exercises. There were separate chapters on the metric system in some books. Metric weights and measures were used in an estimated 10 to 50 percent exercises.

(14) *Rajasthan*

Both new and old coinage were used in exercises upto Class V. Books for classes VI and XI used the new coinage predominantly. There were separate chapters on the metric system in some of the books. Use was made of the metric system in exercises for classes VI and VII.

(15) *Uttar Pradesh*

Both old and new coinage were used in exercises in books for classes II to V and X and XI. Only old coinage was used in books for VI to VIII. There were chapters on the metric system in books for classes III to VIII, classes upto V, and X and XI. A proportion of the examples used metric weights. No use was made of metric weights and measures in books for classes VI to VIII.

(16) *West Bengal*

The 'Kishalaya', Parts I, II and III meant for classes III, IV and V was published by the Director of Public Instruction. Part I had been adequately revised. In Parts II and III, while some space had been devoted to the metric system, a large proportion of the exercises was in the old systems. Books for secondary classes were recommended by the Board of Secondary Education. Some of these books had special chapters on the metric system and the new coinage; but old coinage and weights and measures were used predominantly in exercises.

Recent Steps

It is obvious that textbooks need much more drastic revision than has been attempted in any State so far. The extent of teaching in schools is largely determined by the textbooks in use. Until the textbooks are revised, school children will continue to be taught by reference to weights and measures which have become illegal in the country and are no longer in use.

In order to give the revision of curricula and textbooks an urgency, the question was referred to the All-India Council for Secondary Education which met on 16 and 17 April 1962 in New Delhi. The All-India Council for Secondary Education, on which are represented the Education Departments of the States and the Centre, made a number of recommendations. Some of the important ones are summarised below:

(1) In all illustrations and exercises in textbooks, values should be given exclusively in rupees and naye paise. The only exceptions should be a special chapter for teaching foreign currencies and coinage, as for instance, pound, shilling and pence or dollar and cents.

(2) Instruction in weights and measures should begin with the metric system.

(3) Decimals should be taught at as early a stage as possible to facilitate the study and use of the decimal system of weights and measures.

(4) No use should be made of any weights and measures other than metric weights and measures in illustrations and exercises. The only exceptions would be a special chapter devoted to the teaching of the foot-pound system in higher classes.

(5) No weights and measures other than the metric weights and measures should be taught in the primary classes. The foot-pound system, which is an international system, may be taught at a later stage, that is, the secondary or higher secondary. A separate chapter may be devoted to the teaching of this system.

(6) Brief reference to Indian weights and measures like the maund, seer,

bigha and the like may, if necessary, be made in books for the more advanced classes.

(7) All textbooks, particularly in arithmetic, as also in subjects like geometry elementary science, home science and geography, must be revised as suggested above. The revision must be complete and the revised books brought into use by the beginning of the academic year, 1963-64.

(8) Emphasis should be laid on the need to introduce as early as possible new books using entirely the metric system because when metric weights and measures alone were to be used in the country, it was wasteful to teach the school children any other system of weights and measures.

(9) To facilitate the replacement of existing textbooks, among other things, literature on the subject should be circulated among the States, and the States should have an exchange of curricula and textbooks.

The Future

The above recommendations should now be implemented with zeal and speed. No time should be lost in devising suitable curricula and arrange the writing of new textbooks to take account of the new situation. The textbook writers on their part may require some guidance if a uniform treatment of the subject is to be ensured in all the States. To help the teachers in this work, the Ministry of Education has undertaken to publish a handbook for guidance of textbook writers. The first part relating to classes I to VI has been completed and will be shortly published; the second part is in an advanced stage of preparation.

The work of change in arithmetic teaching is now gathering momentum. This should be maintained. The children should be taught the metric system in the right manner so that they can use it in its proper form in later life. The success of the metric reform is ensured if school children are taught the right way to use it.

News & Views

Recent Notifications

(1) *Length Measures in Pondicherry*

No. S.O. 956 dated 28th March 1962.

In exercise of the powers conferred by sub-section (3) of section 1 of the Standards of Weights and Measures Act, 1956, (89 of 1956) as applied to the State of Pondicherry by the Standards of Weights and Measures (Application to the State of Pondicherry) Order, 1958, the Central Government hereby appoints the 1st day of April, 1962 as the date on which the provisions of the said Act, in so far as they relate to units of length shall come into force throughout the State of Pondicherry.

No. S.O. 957 dated 28th March 1962.

In exercise of the powers conferred by section 14 of the Standards of Weights and Measures Act, 1956 (89 of 1956), as applied to the State of Pondicherry by the Standards of Weights and Measures (Application to the State of Pondicherry) Order, 1958, the Central Government hereby permits, in respect of the areas referred to in the Notification of the Government of India in the Ministry of Commerce and Industry S.O. No. 956, dated the 28th March, 1962, the continuance of the use for a period of six months from the 1st day of April, 1962, of any unit of length which immediately before that date was in use in respect of the said areas.

(2) Amendment to Alcohol Industry Notification

No. S.O. 1098, dated 5th April, 1962.

In exercise of the powers conferred by Section 14 of the Standards of Weights and Measures Act, 1956 (89 of 1956), the Central Government hereby makes the following amendment in the notification of the Government of India in the Ministry of Commerce and Industry No. S.O. 1220, dated the 30th May, 1961, namely :

In the said notification, the following proviso shall be added at the end, namely :

"Provided that, in respect of any such undertaking in or any such department of Government of the State of Andhra Pradesh and the State of Mysore, the Central Government permits the continuance in use of any such weight or measure up to and inclusive of the 30th September, 1962.

No. S.O. 1395 dated 3rd May 1962.

In exercise of the powers conferred by section 14 of the Standards of Weights and Measures Act, 1956 (89 of 1956), the Central Government hereby makes the following amendment in Notification of the Government of India in the Ministry of Commerce and Industry S.O. 1222, dated the 30th May, 1961, namely :

In the said notification, for the words 'not exceeding one year' the words 'not exceeding sixteen months' shall be substituted.

Electricity Output

The total electricity produced by the public utility power stations in India in October 1961 was 1,592·9 million kWh, of which 1,344·8 milion kWh were sold to ultimate consumers.

Corresponding figures for October 1960 were 1,408·3 million kWh and 1,134·7 million kWh and for October 1951, these were 504·9 million kWh and 412·8 million kWh respectively.

Handbook of Weights and Measures in Hindi

Shri J. S. Bakshi, who published 'A Handbook of Weights and Measures' (reviewed in *Metric Measures* March 1961 issue on page 33) has now brought out its Hindi edition, under the title 'Metric Naaptol ki Pustak'. The 'Pustak' priced at Rs. 1·50 is available from Shri J. S. Bakshi, 455, Model Town, Yamuna Nagar, Ambala District, Punjab.

Do's and Dont's—from U.S.A.

A National Weights and Measures Week is celebrated every year in the U.S.A. from 1-7 March. It is promoted locally, Statewise and nationally. The dates March 1-7 commemorate the anniversary of the enactment of the first Weights and Measures Law by the Congress, namely 2 March 1779.

The aim of the National Weights and Measures is to acquaint all sections of society with the nature of this essential Government service which is provided for the protection of the public and the business

interests from incorrect quantity determination in buying and selling transactions.

All the available media of publicity are utilised for the purpose. Thus there are articles in newspapers and programmes over radio and television. Pamphlets are issued as also public addresses delivered by experts in the field.

One of the pamphlets, the material for which has been published in the *Scale Journal*, January 1962 issue, gives a number of guiding points to assure 'getting what is paid'. Some of the do's and dont's are equally applicable in India, particularly now when the compulsion to use verified and stamped weights and measures is being enforced throughout the country. They are as follows :

(1) Trade with merchants who have sealed weighing and measuring devices.

(2) Order by weight, rather than by 'box', 'piece', 'thirty cents worth', etc., unless you know definitely how much you are getting in these quantities.

(3) Never take less than you are entitled to in goods, any more than you would in money.

(4) It is required by law that most commodities have the net weight or count of the contents definitely expressed on the package or container. Net weight is the actual weight of the contents, and does not include the box, can, bottle, etc. Liquid commodities likewise, must show the fluid content.

(5) Be warey of 'bargains'. Sometimes they aren't.

(6) When buying from hucksters, vendors and peddlers, unless you are acquainted with them and know them to have an established residence, be very careful to weigh all purchases. Make a note of their license number so that they may be identified and located, should the occasion warrant action against them.

(7) Don't be afraid to watch the weighing of your purchases. It is for your protection that the law requires the merchant's scale to be visible to consumers at all times. There is no difference in principle between short changing and short weighing. You take a loss either way.

(8) When commodities are placed in a carton or tray, or on paper, for weighing, be sure that you are not charged for the weight of this carton, tray or paper.

(9) The indicator or pointer on the scale must rest at zero mark when the scale is not in use. Periodically, the Weights and Measurements Department checks this setting, as well as the accuracy of the scale, but inspectors cannot be everywhere at all times. Before your purchase is weighed, see that the pointer rests at the zero mark.

(10) Gasoline pump meters also must start operating from the zero setting. If they don't, something is wrong.

(11) Keep an eye on fuel oil deliveries. Metering of this product must begin at zero.

(12) Don't hesitate to notify the Department of Weights and Measures if you think you are being cheated. Your co-operation will help in seeing that everyone gets a fair deal.

The Second International Conference of Legal Metrology

The second International Conference of Legal Metrology was scheduled to come off in Vienna from 11 to 18 June 1962. The General Conference is the supreme body which determines policy and is held every six years; the first was in 1956, when the International Organisation for Legal Metrology came into existence.

During the last six years, the Organisation has done much work. This work along with the future programme would come up for consideration at the second Conference. According to the agenda for the Conference after the formal opening, the President and the Vice-President of the Conference would be elected and the agenda approved. The President would report on the activities of the Organisation. The Conference would then ratify admission of new members and discuss possibilities of further increase in membership.

Progress of technical projects under study by Member States would be reviewed. Projects which may be in advanced stages of preparation would be discussed with a view to making international recommendations, if the progress justified such a step. The achievements of the Centre of Documentation would be examined and directives issued.

An important point relates to the project for a Model Service of Legal Metrology which could be recommended to countries desirous of setting up Departments of Weights and Measures and those that are developing them.

The Organisation has been publishing a quarterly *Bulletin of International Organisation of Legal Metrology*. The progress of the *Bulletin* would be reported and directives issued.

The International Organisation of Legal Metrology (OIML) has liaison with other international bodies such as the UN, UNESCO, the International Committee on Weights and Measures, International Organisation for Standardisation, International Electrotechnical Commission, the European Community and the International Union of Pure and Applied Physics. A report on the activities of these bodies in relation to legal metrology would be presented.

The Conference would also discuss the situation of the Organisation regarding personnel, location and equipment.

After considering the report on the financial position for the period 1956-62, the Organisation would determine the rights of new entrants and take up the budget for 1963-69. The subscriptions to be paid by members during the next six years would also be fixed.

A report on the legal status of the Organisation of French territory would be considered.

The International Committee of Legal Metrology would be constituted and new members elected. The question of amendmen of the International Convention of Legal Metrology would also receive attention.

A report on the recommendations of the Conference would be published in a subsequent issue of *Metric Measures*.

Poll on Metric System in USA

The analysis of over a thousand replies to a questionnaire widely circulated by the 'American Committee for Introducing the Metric System in USA' shows that 90 per cent of American scientists and technicians think that it would be advantageous to go over completely to the metric system, and that the cost would not be prohibitive if a fairly long period is provided for the change over. This has been revealed in an article in the journal of the national standards body of Switzerland. (VSM/SNV Normen Bulletin, Vol. 10, No. 5, p. 37, (1961)

The questionnaire was published in the periodicals of several American organisations including the Society of Civil Engineers,

the Society of Mechanical Engineers, the Institute of Radio Engineers, the Association for the advancement of Science, the Society of Military Engineers, the Geophysical Union, and the Society of Photogrammetry. The questions included and the analysis of replies received were as under :

Question	Answer
(*i*) What is the approximate percentage of units, (Metric, British and others) used in your firm ?	Metric, 45 per cent British, 52 per cent others, 3 per cent
(*ii*) Would it be advantageous if a complete change-over to the metric-system were brought out ?	Yes, 90 per cent
(*iii*) What should be the duration of the transition period ?	Average 22 years, the range being 18 to 29 years
(*iv*) Should Centigrade scale be adopted for temperature ?	Yes, 90 per cent
(*v*) Do you think the American foreign trade suffers as a consequence of the use of British units ?	Yes, 68 per cent
(*vi*) Do you think that the introduction of the Metric system is unavoidable ?	Yes, 68 per cent
(*vii*) Do you think that the cost of change-over would be prohibitive if a long change-over period is provided ?	No, 92 per cent

How to Purchase

In an article 'Gram, Kilogram and Quintal' appearing in *Industrial Bulletin*, published by the Government of Maharashtra (March 1962 issue), Shri V. M. Pednekar, Deputy Director of Industries (Weights and Measures), Maharashtra, has suggested rationalised conversion of weights and measures for use in transactions. They appear eminently suitable for everyday use and are given for use.

If you have been buying *before* — Weights	*Ask now for* — Weights
1 tola (equivalent to 11·66 g)	10 grams
100 tolas (equivalent to 1166 g)	1 kilogram (=1000 g)
1/16 seer or chatak (equivalent to 117 g)	100 grams
¼ seer or pao (equivalent to 233 g)	200 grams
½ seer (equivalent to 467 g)	500 grams
1 seer (equivalent to 930 g)	1 kilogram (=1000 g)
2½ seers (equivalent to 2·33 kg)	2 kilograms

(ISI Bulletin, March-April 1962, p. 89)

5 seers (equivalent to 4·66 kg)	5 kilograms
10 seers (equivalent to 9·33 kg)	10 kilograms
20 seers (equivalent to 18·66 kg)	20 kilograms
1 maund (equivalent to 37 kg)	40 kilograms
2½ maunds (equivalent to 93 kg)	1 quintal (=100 kg)
1 oz. (equivalent to 31 g) ..	30 grams
1 lb (equivalent to 454 g) ..	500 grams
2 lb (equivalent to 907 g) ..	1 kilogram (=1000 g)
7 lb (equivalent to 3·17 kg)	3 kilograms
14 lb or stone (equivalent to 6·35 kg)	5 kilograms
28 lb or quarter (equivalent to 12·70 kg)..	10 kilograms
56 lb (equivalent to 25·40 kg)	20 kilograms
112 lb or cwt (equivalent to 51 kg)	50 kilograms
1 ton (equivalant to 1016 kg)	1000 kilograms (=tonne)

If you have been buying *before* — Capacity	Ask *now for* — Capacity
1 pao seer (equivalent to 233 ml)	200 millilitres
½ seer (equivalent to 469 ml)	500 millilitres

1 seer (equivalent to 930 ml) ..	1 litre (=1000 ml)
1 maund (equivalent to 371)	40 litres
1 fluid oz (equivalent to 28·4 ml)	30 millilitres
1 pint equivalent to 0·57 l)	500 millilitres
1 quart (equivalent to 1·14 l)	1 litre (=1000 ml)
1 gallon (equivalent to 4·54 l)	5 litres

Length	Length
1 foot (equivalent to 304 mm)	300 millimetres
1 yard (equivalent to 914 cm)	1 metre (=1000 mm)
50 feet (equivalent to 152·24 m)	15 metres
100 feet (equivalent to 30·48 m)	30 metres
1 furlong (equivalent to 201 m)	200 metres
1 mile (equivalent to 1609 m)	1 kilomerte (=1000 m)

Sixth Conference of Controllers of Weights & Measures

The sixth Conference of Controllers of Weights and Measures would be held in Rajaji Hall, Madras on 6th to 9th August 1962.

A number of points are scheduled to be discussed in the Conference. Some of the important ones are given below :

(1) Review of the progress in implementing the fifth Conference of Controllers.

(2) Review of progress in enforcing metric weights and measures :

The use of metric weights has become compulsory all over the country from April 1962. The various difficulties that may have cropped up would be discussed. From October 1962, the use of length measures would be compulsory and the steps to be taken to enforce them successfully would be considered. The use of capacity measures has become compulsory in certain areas and their use is permissible all over the country. The steps to be taken to meet the various requirements would be gone into.

(3) An important point concerns the discussion on the present state of Enforcement Organisation in the States. It will be recalled that the fifth Conference of Controllers had suggested a certain pattern of Organisation to the States. Review of the present position would be taken up in the Conference.

(4) Publicity.

(5) Enforcement of weights and measures in the petroleum industry.

(6) Discussion on the Report submitted by M. Francis Viaud and M. Louis Krach on the administration of Weights and Measures Organisation.

(A short summay of the more important recommendations was given in the March 1962 issues of *Metric Measures*; on pages 10–13 and 30).

(7) The denominations of small weights which should be stamped and the manner of their stamping.

(8) Various subjects proposed by the Controllers.

A report on the Conference would be published in a subsequent issue of *Metric Measures*.

Readers' Forum

(A tendency has been noticeable on the part of traders in many areas to price and weigh out commodities in terms of the seer and pao but to use metric weights for the transaction. The legal implications of this practice are analysed below by discussing a recent case——*Editor*).

Use of Standard Units

Sir,

A wholesale vegetable dealer in Delhi had surreptitiously slipped a stone piece in the heap of the commodity placed in the goods pan. The other pan contained a weight of 5 kg. This ruse was detected. The trader thus attempted to deliver short to the extent of the stone piece placed in the goods pan. Further no unit other than metric is legal for any trade transaction. Section 7 of Rajasthan Weights & Measures (Enforcement) Act, 1958 as extended to the Union Territory of Delhi, clearly lays down that only standard weights shall be used. Moreover, Section 32 of the Act says :

> Whoever in selling any article by weight or measure delivers or causes to be delivered to the purchaser less than what is purported to be sold, if the deficiency exceeds the prescribed limit of error, be punishable with fine which may extend to three hundred rupees.

Section 7 of the Act, which prohibits the use of non-metric units was also applied simultaneously in this case. The use of Section 7 was to provide a two-pronged attack on the case, so that the offender might not find it convenient to take shelter under the plea that he was delivering 5 seers. The maximum penalty under Section 7, read with Section 23, is Rs. 2,000. For obvious reasons, preferring a lighter punishment under Section 32, the offender confessed his guilt of short delivery and was convicted by the Court. From this particular case the desirability of taking the two Sections together will be clear.

Another offence of a slightly different nature came to light during raids conducted at wholesale vegetable markets. The habit of quoting rates per 5 seers or per $2\frac{1}{2}$ seers and seeking their equivalents in the new series often led traders to a clever contrivance of suspending 6 chhatak of a load (when 5 seer of a commodity is to be weighed against 5 kg) or of 3 chhatak (when $2\frac{1}{2}$ seer is to be weighed against $2\frac{1}{2}$ kg) from the end of the beam supporting the goods pan. This interconversion defeats the very purpose of the reform *i.e.*, of simplifying calculations. Besides, it exposes the dealers to legal action for disregard of Section 29 of the Act, which reads :

> Whoever fraudulently uses any standard weight or measure or weighing or measuring instrument which he knows to be false shall be punishable with imprisonment for a period which may extend to one year or with fine or with both.

One fails to understand, why the traders, instead of learning the basic metric units, their multiples and submultiples and co-relating them to rupees and naye paise, labour through wrong channels that create more confusion and complications. It

should be remembered that 100 nP. make a rupee and one thousand grams make a kilo.

This inclination towards interconversion is carried down to the level of retail trade also; 70 g placed in the goods pan against 1 kg and 30 g against 500 g to make 1 seer and ½ seer respectively, are practices finding favour with some of the retail traders. Use of stones of equivalant weight is also not uncommon.

The Organisation of Weights and Measures, Delhi, is taking steps against such evils. Inspectors have been detailed to carry out surprise raids and inspections to liquidate such pockets. The local wholesale and retail trade associations have been informed to persuade their members to give up such practices lest the latter should be penalised. The case cited above has been brought to the notice of the members of the Fruit and Vegetable Merchants' Association through a handbill issued by the Association at the request of the Organisation of Weights and Measures. Besides this, press communications issued from time to time, radio broadcasts and telecast performances are serving as constant reminders to traders. The public have also been requested to ask for their requirements in terms of metric units exclusively.

*School Atlas**

THE Survey of India has recently brought out a new School Atlas 'with the aim of placing in the hands of our students a compilation of authentic geographical information through maps of India and other countries as derived from reliable sources within the country'.

There has been keen demand for an authentic atlas, particularly giving maps of the various regions of India, for the past few years. In spite of many atlases brought out by various publishing agencies, this need was still felt by students of geography and allied subjects. This publication of the Government of India is, therefore very timely.

The atlas is comprehensive and contains 77 maps, 19 illustrations and other very useful information.

Metric Units Used

What is interesting is that all the maps are based on the metric system. Distances, heights of mountains, lengths of rivers, areas under various crops, temperatures and other similar data are all given in the metric system.

There is a current impression that besides arithmetic, there are no other subjects which would have to be taught in terms of the metric system. That this impression is not fully correct is apparent on a glance at this atlas.

*SCHOOL ATLAS—Published on behalf of the Ministry of Scientific Research & Cultural Affairs Government of India, under the direction of the Surveyor General of India, Dehra Dun; First Edition; 1961; pp 62; price Rs. 5·00

A few examples from this atlas would illustrate this point. The very first table in the atlas gives distances of principal cities in the world and timings. The following short extract from this table would indicate how we have now to revise our ideas about distances between cities in the world :

TABLE I

DISTANCES OF PRINCIPAL CITIES OF THE WORLD AND TIMINGS

S. No.	Name of City	Name of Country	Standard Time* When it is noon at Delhi		†Distance from			
					Delhi	Bombay	Madras	Calcutta
			h	m	km	km	km	km
(1)	Cairo	U.A.R. (Egypt)	08	30	4,420	4,350	5,350	5,690
(2)	Canberra	Australia	16	30	10,320	10,000	8,980	9,040
(3)	Colombo	Ceylon	12	00	2,430	1,530	680	1,960
(4)	Dajakarta	Indonesia	14	00	5,010	4,660	3,640	3,780
(5)	Geneva	Switzerland	07	30	6,350	6,720	7,740	7,640
(6)	Kabul	Afghanistan	11	00	990	1,770	2,620	2,280
(7)	Karachi	Pakistan	11	30	1,090	890	1,910	2,180
(8)	Katmandu	Nepal	12	00	790	1,600	1,690	650
(9)	London	U.K.	06	30	6,710	7,200	8,190	7,960
(10)	Moscow	U.S.S.R	09	30	4,360	5,050	5,990	5,540
(11)	New York	U.S.A.	01	30	11,740	12,530	13,450	12,730
(12)	Paris	France	07	30	6,590	7,020	8,030	7,820
(13)	Peking	China	14	30	3,780	4,760	4,620	3,270
(14)	Rangoon	Burma	13	00	2,340	2,480	1,760	1,040
(15)	Singapore	Singapore	14	00	4,140	3,900	2,900	2,890
(16)	Tokyo	Japan	15	30	5,820	6,720	6,400	5,120

*Mid-day at Delhi has been taken as the Indian Standard time (not Local Mean Time) of 1200 hours. Similarly timings at world cities are given in terms of the Standard Time of their countries/zones, instead of Local Mean Time of the cities.

†Distances are given to nearest 20 km.

There are other tables which would be of interest not only to students but even to those who wish to add to their general knowledge. One such table indicates the times for sunrise and sunset at 15 day intervals at Delhi, Bombay, Madras and Calcutta.

The item 'Some Useful Information About India' is so richly informative that it deserves to be given in full.

SOME USEFUL INFORMATION ABOUT INDIA

Length of land frontiers of India	15,200 km	North to South (Distance between the Northernmost tip ($\lambda = 37° 06'$, $L = 74° 42'$) of Kashmir to Cape Comorin ($\lambda = 8° 04'$, $L = 77° 33'$) ..	3,200 km
Length of Indian coast-line (including Goa 160 km)	5,700 km		
Length and Breadth of the Mainland of India :		Area of India	3,263,300 km²
West to East (Distance between Westernmost tip of Gujarat ($\lambda = 23° 37'$, $L = 68° 07'$) to the Easternmost tip of Assam ($\lambda = 28° 01'$, $L = 97° 25'$) ..	3,000 km	Area of Sikkim*	7,100 km²
		Area of Bhutan*	40,200 km²
		Area of Foreign Possessions (Portuguese)	4,200 km²

(*States attached to India by special treaties).

Area of Individual States of India

(1)	Andaman & Nicobar Islands	8,300 km²
(2)	Andhra Pradesh	274,700 km²
(3)	Assam	219,900 km²
(4)	Bihar	174,000 km²
(5)	Delhi	1,500 km²
(6)	Gujarat	187,100 km²
(7)	Himachal Pradesh	28,200 km²
(8)	Jammu & Kashmir	222,800 km²
(9)	Kerala	38,900 km²
(10)	Laccadive, Minicoy & Amindivi Islands	30 km²
(11)	Madhya Pradesh	443,400 km²
(12)	Madras	129,800 km²
(13)	Maharashtra	307,500 km²
(14)	Manipur	22,300 km²
(15)	Mysore	192,200 km²
(16)	Orissa	155,800 km²
(17)	Pondicherry	500 km²
(18)	Punjab	121,900 km²
(19)	Rajasthan	342,300 km²
(20)	Tripura	10,500 km²
(21)	Uttar Pradesh	293,800 km²
(22)	West Bengal	87,900 km²

Besides these useful tables, there is a chart showing comparative heights of mountains and lengths of rivers. Many of us may know the heights of mountains and lengths of rivers in feet and miles. How many of us, however, are aware of the metric figures for these ? The atlas supplies ready made answers. The following information tabulated from the chart would interest every one of us.

TABLE 2

HEIGHTS OF MOUNTAINS

Name of Mountains	Height in Metres
Mount Everest	8848
Mount K²	8611
Kanchanjunga	8598
Dhaulagiri	8172
Nanda Devi	7817
Aconcagua (South America)	7035
Kedarnath	6940
Mount Mckinley (North America)	6187
Kilimanjaro (Africa)	5895
Mount Blanc (Europe)	4810
Erebus (Antarctica)	4054
Anai Mudi	2695
Kosciusko (Australia)	2234

(*Note*–The above length and area figures are approximate).

TABLE 3

LENGTHS OF RIVERS

Name of Rivers	Length in Kilometres
Nile (Africa)	6690
Amazon (South America)	6280
Missouri-Mississippi (N. America)	6260
Ob (Asia)	5150
Yangtze (Asia)	4990
Murray (Australia)	3720
Volga (Europe)	3700
Indus	2900
Brahmaputra	2900
Ganga	2510
Godavari	1450
Narmada	1290
Krishna	1290
Mahanadi	890
Cauvery	760

Among the maps of the world are those indicating the annual rainfall, ocean currents, isobars and winds, isotherms etc. Physical and political maps of the continents are included.

The section dealing with maps of India and its States is the largest. Besides the political and physical maps, other maps show road and air routes, Railways and sea routes, soils, population, forest and irrigated areas, archaeology and tourism, annual average rainfall, isobars and prevailing winds, temperature, geology and principal minerals, crops and industries. Besides these, maps of various regions of India are also included. The map of 'The Great Himalaya' is interesting.

An exhaustive index to place names rounds off an excellent atlas of 62 pages.

The atlas has been printed beautifully and the clarity of presentation is commendable. It is a publication which deserves to be among the books of school and college students and others who are interested in the geography of India and the world.

For the amount of information it contains, the price of Rs. 5·00 does not appear to be high.

Book Review

ADOPTION OF METRIC SYSTEM IN INDIA

Five Years of Progress (English)—Government of India, Ministry of Commerce and Industry; January 1962; pp. 53. Price Rs. 0·25. (Available from the Manager of Publications Old Secretariat, Delhi-8).

This pamphlet is a review of the progress achieved in five years in the introduction of the metric system of weights and measures in India.

The Government of India decided to adopt the metric system of weights and measures and decimal coinage in April 1955. By December 1956, the Standards of Weights and Measures Act, 1956 was put on the Statute Book and the introduction of decimal coinage begun in April 1957. Area-wise and industry-wise introduction of metric system was begun in October 1958 and the compulsion to use metric weights has become legally effective all over the country from April 1962. Measures of length and capacity for general transactions would have to be compulsorily used by April 1963. Many industries have already changed over to the use of metric weights and measures in their transactions. Against this background it would be interesting to review the progress made.

Decimal coins were first introduced in April 1957. Since then till 30 June, 1961, some 4391·3 million coins have been put in circulation as follows :

50 nP	.. ..	22·8 million
25 nP	.. ..	185·4 million
10 nP	.. ..	610·8 million
5 nP	.. ..	690·5 million
2 nP	.. ..	963·3 million
1 nP	.. ..	1918·5 million
	Total	4391·3 million

All the old coins except the one paisa and the anna have been withdrawn. It is expected that the anna and paisa coins would be withdrawn from circulation by the middle of 1963.

The pamphlet, which runs into 15 chapters, then discusses the various provisions of the Standards of Weights and Measures Act, 1956, the reasoning behind the adoption of international nomenclature of weights and measures, and the steps taken to introduce uniform laws in this field in all the States. The States had to establish organisations for the proper enforcement of weights and measures. The Inspectors of Weights and Measures had to be provided with standard weights, measures and balances while the public had to be supplied crores of commercial weights and measures.

The initial introduction of weights began in October 1958 in selected areas in the country and in certain well-organized industries. By 1962, considerable progress had been achieved and use of metric weights became compulsory all over the country while length measures would be compulsory from October 1962 and capacity measures from April 1963. Metric weights and measures were introduced not only in transactions but also in their products in industries such as cotton textiles, jute, iron and steel, engineering, heavy chemicals, cement, fertilizers, refractories, copper, aluminium, rubber, coir, sugar, vanaspati, paint, biscuit, soap, drugs, tea, coffee, salt, paper, petroleum, woollen goods, tobacco, alcohol and many others.

The Railways, Posts and Telegraphs, Customs and Excise, Meteorology have now adopted the metric system in all their dealings. A programme has been laid down for a three stage change-over in the field of building architecture and town planning. Land surveys, printing and stationery, ports, transport etc., have started the change-over to the metric system.

Unless correct units are used for transactions in trade, the adoption of the metric system would not be complete. A whole chapter is devoted to these units. Similarly, the change-over in the field of education has also been given a prominent place. Publicity has to play an important part in the change-over and it finds due place.

In the chapter on 'Task Ahead', an analysis has been made of what has been achieved and what remains to be done. It has been brought out that what has been achieved has to be stabilised, maintained and further progress assured. Metric habits have to be made a part of life of every person in the country. It is also necessary to expand the field covered by the Weights and Measures Departments so as to undertake more intricate jobs like the standardisation of water meters, electric meters, taxi meters etc. With the industrialisation of the country the responsibilities of the Weights and Measures Departments would increase because weights and measures are the very basis of every industry. The task, therefore, would have to be extended into the future for a very long time and co-ordinated Centrally.

The pamphlet is a timely summary of the achievements so far in the adoption of metric system. On reading it, one feels that India has made much more progress in this field than was predicted for it by many. The expectation that the change-over would create utter confusion has been belied and the prophets who predicted that vast sums of money would have to be spent on the change-over have also been proved incorrect. A reform, which is of such a magnitude that it touches every human being throughout his life on earth, is being effected with the minimum of confusion. Industries have been able to make the change-over, particularly in the commercial branches, with little dislocation of production. In the engineering and design fields, the change-over is bound to take more time. It will also have to be carried out systematically so as to keep the cost low.

The rapid industrialisation of the country requires more and more machines and new methods of weighing and measuring would have to be standardised and enforced in future. There would be need for Central guidance in all those matters. It is to be hoped that such guidance would be available in the future.

The pamphlet is written in a simple and direct language and should be read by everybody who wants to keep himself abreast of the metric reform.

THE TEACHING OF MATHEMATICS

(English)—(A Guide Book for Teachers of Standards I to VII), published by S.I.T.U. Publication Ltd. for the S.I.T.U. Council of Educational Research Madras-28; 1962; pp. 140; Price: Rs. 3.00.

This Bulletin is described as 'A Report containing principles and methods of teaching, the syllabus reshaped to suit the introduction of Decimal Coinage and Metric Measures and Weights, units, etc., etc.' This explanation gives ample indication of the scope of the subject it covers.

The adoption of the metric system has now become a settled fact and in another year, it will be legally compulsory to use only metric weights and measures. Elementary arithmetic is always oriented towards the daily needs of the people, and so has to reflect changes that have taken place. The change-over in education, however,

is not easy because it is necessary to plan it out so that the children are taught the subject in the right manner. The syllabi are to be changed and textbooks written to suit the metric requirements.

Earlier the syllabus of school arithmetic was changed by the Inter-State Board of Anglo-Indian Education (see *Metric Measures*, March 1961, pp. 14-19). The present effort is the second. A group of teachers have discussed the problem and presented their results for consideration through this Bulletin. It is a timely addition to the books on teaching of arithmetic with particular reference to the adoption of the metric system.

The Bulletin is divided into six sections. The first section gives broad aims and objects and the present mathematics syllabus with special reference to metric system and decimals. The second section deals with the four Rules applied to decimals, the third deals with 'method—decimal basis of the number system' and the fourth, which is the most comprehensive, lays down a detailed syllabus for standards I to VII (aims, objectives, skill, etc.); a special section of it deals with approximation, significant digits and contracted method etc. The fifth section is on evaluation while the sixth section gives reports of Sub-committees. There are eight appendices giving various tables, vocabulary, symbols suggested, relating problems to life, errors likely to be committed by pupils and so on.

The Bulletin rightly emphasises that the stress should not be taken away from fractions and laid on decimals. Right from the beginning numerous examples are given illustrating how decimal teaching can be carried out with the help of decimal coinage and metric weights and measures. A comprehensive syllabus running into over 50 pages is a testimony to the depth of which the subject has been studied by the group of teachers.

One of the recommendations is that the new textbooks should be brought out early and authorities should create conditions favourable for the production of such textbooks. It is also recommended that the traditional method of introducing decimal through fractions should be given up and children should be made to think in decimals and greater emphasis should be laid on decimals as the metric system is purely a decimal system. It should be feasible to begin the decimal system in standard III and teach it on the basis of new system of money.

On going through the Bulletin one is inclined to agree with most of the recommendations made. There is, however, one about which there could be two opinions. In the syllabus that is prescribed the use of the British units as also acquaintance with the older units like the viss and the seer and the like, is also considered essential.

It is not clear why students should at all be taught the British or old Indian systems in classes up to VII. Perhaps, it may be desirable not to teach any of these up to even one or two years later *i.e.*, up to IX. Even then, only British system, being an international system, may be taught for the sake of acquaintance in the last one or two years of the school career of the student.

In the use of decimals, it may be desirable to introduce the practice of putting a zero before a decimal fraction, for example, 0·2 and not ·2. It is also necessary that in setting examples, proper units like kilo, quintal, tonne etc., should be used. The use of appropriate abbreviations for the various metric units is extremely desirable and it is gratifying that this has been done in a large measure in this Bulletin although at places this has not been done.

The study is exhaustive, the recommendations are practicable except as indicated earlier and it would be desirable that State Governments take note of the syllabus that has been prescribed and take steps to devise their own syllabus early.

Standards News

(Indian Standards which have a particular bearing on the change-over to the metric system are indicated here. Copies would be available from the Indian Standards Institution, Manak Bhavan, 9 Mathura Road, New Delhi or their Branch Offices at Bombay, Calcutta, Madras and Kanpur).

Indian Standard for Cold Formed Light Gauge Structural Steel Sections (IS: 811-1961)

The Indian Standards Institution has published an Indian Standard Specification for Cold Formed Light Gauge Structural Steel Sections (IS: 811-1961), which lays down the nominal dimensions, weight and geometrical properties for cold formed light gauge structural steel section for normal applications. To assist the designers to evolve other sections, illustrative procedures are given in an appendix to the standard. Tolerances on profile and ordered lengths are also specified.

This standard is one of a series of Indian Standards being published under the Steel Economy Programme. The object of this programme is to achieve economy in the use of structural steel by establishing rational, efficient and optimum standards for structural sections; formulation of standard codes of practice for the design and fabrication of steel structures; popularization of welding in steel construction; and co-ordination and sponsoring of experimental research relating to the production and use of structural steels which will enable the formulation and revision of standard specifications and codes of practice.

Metric system has been adopted in India and all quantities and dimensions in this standard have been given in this system.

Price: Rs. 5.50

Indian Standard for Set Squares for Use of Drawing Offices (IS: 1561-1962)

The Indian Standards Institution has published an Indian Standard Specification for Set Squares for Use of Drawing Offices (IS:1561-1962). This standard covers requirements for two types of fixed angle set squares, namely, (a) 45 degree—45 degree, and (b) 60 degree—30 degree complementary angles; commonly used by cartographers, surveyors and engineers.

Metric System has been adopted in India and all values given in this standard have been given in this system.

Price : Re. 1·00

Indian Standard for Person Weighing Machines (IS : 1854-1961)

The Indian Standards Institution has published IS: 1854-1961 specification for Person Weighing Machines, which covers the requirements of the person weighing machines.

This standard is one of a series of Indian Standards on commercial weighing machines, being prepared at the instance of the Standing Metric Committee, Government of India, in connection with the introduction of metric system of weights and measures in the country.

Price : Rs. 1·50

Indian Standard for Thread Cutting Dies (IS: 1859-1961)

The Indian Standards Institution has published IS:1859-1961 Specification for Thread Cutting Dies, which covers the requirements of thread cutting and thread finishing dies for metric threads with coarse and fine pitches for general engineering purposes, and pipe threads.

Price : Rs. 2·00

Indian Standard for Test Chart for Lathes (IS: 1878-1961) (Upto 800 mm Swing Over Bed)

The Indian Standards Institution has published an Indian Standard Test Chart for Lathes (Upto 800 mm Swing Over Bed) (IS: 1878-1961), which prescribes the limits of accuracies for lathes upto 800 mm swing over bed.

The quality of the machine tools in general and of lathes in particular, manufactured by the leading manufacturers in the country, has considerably improved in the last few years and is comparable to lathes of the high quality manufactured in industrially advanced countries. After taking into consideration the manufacturing practices prevailing in the country and in particular with the better organized manufacturers, it was decided to recognize limits of accuracy as detailed in this standard. It is hoped that within a short time a much larger number of manufacturers would be able to supply freely lathes complying with the requirements of this standard.

This standard is the first of a series of Indian Standards that have been planned to cover the types of machine tools that are being manufactured or the manufacture of which is at advanced stages of planning. Work on preparing similar test charts for milling machines, drilling machines and planing and shaping machines has also been initiated.

Price: Rs. 3.00

Indian Standard for Malleable Cast Iron Pipe Fittings (IS : 1879-1961)

The Indian Standards Institution has published an Indian Standard Specification for Malleable cast Iron Pipe Fittings (IS:1879-1961), which covers malleable cast iron pipe fittings screwed in accordance with IS:554-1955 Specification for pipe Threads for Gas List Tubes and Screwed Fittings (Tentative). The dimensions specified (centre-to-face, face-to-face and centre-to-centre) are essential for interchangeability. Dimensions which are not included in the standard are left to the discretion of the manufacturer depending on the end use of the fittings.

Out of a range of types and sizes of fittings of more than 2,000 items which had been standardized by various countries of the world, the International Organisation for Standardization (ISO) through its Technical Committee concerned after prolonged efforts started in 1952, has, with the agreement of the participating countries, chosen 638 malleable cast iron fittings, which are necessary for general use and which are being manufactured in mass production. These rationlized types and sizes of fittings have been covered in an ISO Recommendation. With a view to assisting the industry in India to fall in line with the practice followed in other countries of the world, the Sectional Committee of ISI responsible for the preparation of this standard has decided to base it on the ISO Recommendation mentioned above.

Metric System has been adopted in India

and all quantities and dimensions in this standard have been given in this system.

Price: Rs. 5.00

Indian Standard for Boiler Rivets (IS: 1928-1961) (12 to 48 mm Diameter)

The Indian Standards Institution has published an Indian Standard Specification for Boiler Rivets (12 to 48 mm Diameter) (IS: 1928-1961), which prescribes the requirements for boiler rivets, 12 to 48 mm in diameter.

This standard, which is one of a series of Indian Standards being prepared by the Institution on metric screw threads and fasteners, deals with mild steel rivets intended for use in construction of boilers, the question of preparing a similar standard for high tensile rivets for boiler construction is under consideration.

Metric System has been adopted in India and all dimensions and quantities in this standard have been given in this system.

Price: Rs. 2.00

Indian Standard for Overall Internal Heights for Lathe Tool Posts (IS: 1995-1962)

The Indian Standards Institution has published IS: 1929-1961 Indian Standard Specification for Rivets for General Purposes (12 to 48 mm Diameter), which prescribes the requirements for mildsteel and high tensile steel rivets, 12 to 48 mm in diameter, for general purposes.

This is one of a series of Indian Standards being prepared by the Institution on metric threads and fasteners.

Metric system has been adopted in India and all dimensions and quantities in this standard have been given in this system.

Price: Rs. 2.50

Indian Standard for Rivets for General Purposes (IS: 1929-1961) (12 to 48 mm Diameter)

The Indian Standards Institution has published an Indian Standard Overall Internal Heights for Lathe Tool, Posts (IS: 1995-1962). This standard prescribes the overall internal heights for lathe tool posts with reference to the horizontal axis of the lathe for various heights of the tool shanks, and is largely based on the relevant recommendation formulated by the International Organization for Standardization.

Metric system has been adopted in India and all the dimensions in this standard have been given in this system.

Price: Re. 1.00

Indian Standard for Building Bricks Doe-BDC 30 (546)/-

The Indian Standards Institution has circulated for comments the following two drafts Indian Standards Specification on building bricks :

(1) Specification for Heavy-Duty Burnt-Clay Building Bricks Doc:BDC 30 (609)

This draft standard covers dimensions, quality and strength of heavy duty burnt clay building bricks.

Heavy-duty bricks (also known as "engineering bricks" are required for masonry in heavy engineering works such as bridge structures, industrial foundations, multistoreyed buildings, etc. In view of a large number of such works being undertaken in the Third Five Year Plan and also subsequently, the need for manufacture of heavy-duty bricks on a large scale has been felt.

(2) Specification for Burnt Clay-Perforated Building Bricks/Doc:BDC 30 (546)/-

This draft standard lays down the essential requirements regarding dimensions, strength, bulk, density, etc. of perforated bricks and is intended to serve as a guide for control of their quantity in manufacture and use.

Perforated bricks are characterized by advantages such as weight, less fuel consumption in manufacture compared to common bricks, improved thermal insulation, etc. As a result of the extensive programme of building construction undertaken in this

country, the need for increased supply of bricks is keenly felt by the building trade; and while the bricks industry steps up its production to meet this growing demand; it is but appropriate that improved and special types of bricks are also introduced for use by builders in addition to the common bricks. Perforated brick is an important example among these special types. At present, perforated bricks are being used in large quantities in several countries abroad and are found to be suitable for single-storeyed as well as for multi-storeyed constructions and for lowcost housing.

Licensed Manufacturers, Dealers and Repairers of Weights and Measurers (20)

Metric Measures has been publishing a series of lists of manufacturers, dealers and repairers of weights and measures, weighing and measuring instruments licensed by the Governments in the various States and Union Territories under Weights and Measures (Enforcement) Acts in their respective jurisdiction. This is the twentieth list. The first list appeared in the March, 1959 issue.

Progressively steps are being taken for licensing manufacturers, dealers and repairers in all States and further lists of licensees would be published in the *Metric Measures* as this work progresses etc.

The number in brackets aganist the name of the State or Union Territory indicates the particular instalments number of the State of the Union Territory. The issues of the *Metric Measures* in which previous lists appear are also shown suitably.

An analysis of the licenses, including the present list, shows that the total number of licensees in 14 States and 4 Union Territories is 1035 manufacturers, 4484 dealers and 968 repairers. The details of published information are as follows :

Sl. No.	State/Union Territory	Licensees		
		Manufacturers	Dealers	Repairers
(1)	Andhra Pradesh ..	40	84	31
(2)	Assam	16	97	28
(3)	Bihar	20	69	34
(4)	*Delhi*	28	93	20
(5)	Gujerat	109	578	132
(6)	*Himachal Pradesh* ..	1	28	1
(7)	Kerala	40	389	116
(8)	Madhya Pradesh ..	115	496	9
(9)	Madras	79	828	126
(10)	Maharashtra ..	101	163	185
(11)	Manipur	14	85	5
(12)	Mysore	104	471	165
(13)	Orissa	14	17	1
(14)	Punjab	38	156	28
(15)	Rajasthan	43	206	44
(16)	*Tripura*	1	9	0
(17)	Uttar Pradesh ..	207	515	88
(18)	West Bengal	65	200	55
		1,035	4,484	968

ASSAM (3)

In the March and September 1961 issues of Metric Measures, lists of manufacturers, dealers and repairers licensed by the Government of Assam were published. The following is a list of manufacturers, dealers and repairers of weights and measures since licensed under the Assam Weights and Measures (Enforcement) Act, 1960:

Manufacturers

Sl. No.	Name and Address of the Manufacturer	Details of Article manufactured
(1)	Assam Industries, P.O. Hojai, Dist. Nowgong	Weights, Measures, Weighing and Measuring Instruments.
(2)	India Wire Products, Makam Road, Tinsukia	Weights, Measures, Weighing and Measuring Instruments.
(3)	Shyam Steel Construction Company, Haifergaon, P.O. Nowgong.	Weights, Measures, Weighing and Measuring Instruments.
(4)	Steels Work Limited, Commercial Building, Tezpur ..	Weights, Measures, Weighing and Measuring Instruments.
(5)	Tinsukia Steel and Wire Manufacturing Co., Udyonagar, Tinsukia.	Weights and Measures, Weighing and Measuring Instruments.

DEALERS OF WEIGHTS AND MEASURES, WEIGHING AND MEASURING INSTRUMENTS

(1) Amolakchand Labhchand, Mankachar, Goalpara.
(2) Amolakchand Murlidhar, General Merchants & Commission Agents, Dolmukh Road, Sibsagar.
(3) Assam Hardware Agency, Hardware Merchants, Netaji Subhas Road, Dhubri.
(4) Assam Industries, P.O. Hozai, Dist. Nowgong.
(5) Avery Company of India (P), Lakhtokia Road, Gauhati.
(6) Banshi Lal Jagal Kishore, Jorhat.
(7) Budhmall Indur Chand, Sibsagar.
(8) Bharat Hardware Stores, Jorhat.
(9) Bhawaram Jodhraj & Co., Dibrugarh, Lakhimpur.
(10) K. C. Bairagi & Sons, P.O. Bilashipara, Goalpara.
(11) Chandi Stores, Bokakhat.
(12) Dhubri Hardware Stores, Netaji Subhas Road, Dhubri.
(13) Director, Trade & Industry Pvt. Ltd., Tezpur, Darrang.
(14) Durga Nath Pant & Bros, Dhubri.
(15) Gajanand Chachan, G.S. Road, Shillong (U.K. Jaintia Hills)
(16) Ganesh Ram Sharma & Co., A.T. Road, Jorhat.
(17) Goalpara Motor Cycle Co., Goalpara.
(18) Gordhanlall Ashalall, Dhekiajuli, Darrang.
(19) Hanuman Hardware Stores, Golaghat.
(20) Hindustan Hardware Stores, Gara Ali, Jorhat.
(21) Hojai Marketing Co-operative Society Ltd., P.O. Hojai, Nowgong, Hojai.
(22) India Wire Products, Tinsukia.
(23) Jaskaron Sohanlal (P) Ltd., Jorhat.
(24) Karla & Co., G.S. Road, Shillong.
(25) Kharagchand Ramnath & Co., A.T. Road, Dibrugarh.
(26) Khubchand Agarwalla, Haiborgaon, Nowgong.
(27) Kilburn & Co., Pvt. Ltd., Tezpur, Darrang.
(28) Krishanlal Mahabir Prasad, Tarabari Hot, Kamrup.
(29) Lachminarayan Satyanarayan, Golaghat.
(30) Lakhmi Narayan Sarojmal, P.O. Golaghat.

Dealers (*Contd.*)

(31) Mahabir Prasad Krishanlal & Co.,
Marwari Road, Dibrugarh.

(32) Matri Bhandar,
Dhubri.

(33) Maya Ram Bhagwan Das,
Siding Bazar, Tinsukhia,
Dist. Lahiripur.

(34) Modern Store,
Dhubri.

(35) Murlidhar Megharaj,
Marwaripatty,
Sibsagar.

(36) Narayan Store,
Fancy Bazar, Gauhati.

(37) National Enterprise (India),
Promtala, Silchar.

(38) Niranjan Chittaranjan,
Abhayapuri, Goalpara,
G. T. Roy & Sons,
Dhubri, Dist. Goalpara.

(39) Pirdan,
Chhaganlall,
Sibsagar.

(40) Prabhat Chandra, Roy,
Karimganj,
Cachar.

(41) Radhyashyam Agarwalla,
Assam Iron Stores, Baiborgaon,
Nowgong.

(42) Ramakrishan Shree Gopal,
A.T. Road,
Jorhat.

(43) Ranglar Bagarie,
Harbargaon, Nowgong.

(44) Sarada Stores,
Shrikrishan Sarada Road,
Haila Kandi.

(45) Sharma & Co.,
Gar Ali, Jorhat.

(46) Shyam Steel,
Construction Company,
Nowgong.

(47) Sobhagmal Ghoramal,
A.T. Road,
Nowgong.

(48) Sita Ram Kishanlal,
Barpota Road,
Kamrup.

(49) K. B. Stores,
Main Road,
Tezpur, Darrang.

(50) Sudhir Chandra Das & Sons (India) P. Ltd.,
Fancy Bazar,
Gauhati.

(51) Sukhalal Sankarla,
Marwaripatty,
Sibsagar.

(52) Tinsukia Stool & Wire Manfacturing Co.,
Udyognagar,
Tinsukia.

(53) Town Stores,
Dhubri.

REPAIRERS OF WEIGHTS AND MEASURES, WEIGHING AND MEASURING INSTRUMENTS

Repairers

(1) Assam Industries,
P.O. Jojai,
Dist. Nowgong.

(2) Burdeswar Koch,
B.O.C. (I.T.) Ltd.,
Digboi.

(3) Chamanlal David,
Caltex (India) Ltd.,
Pandu (Assam).

(4) J. C. Gogai.
C/o B.O.C. (I.T.) Ltd.,
Digboi.

(5) Hanuman Industries,
Fancy Bazar, Gauhati.

(6) R. B. Industries,
Fancy Bazar, Gauhati.

(7) Md. Maniruddin,
C/o B.O.C. (I.T.) Ltd.,
Digboi.

(8) Sihotia Steel Trunck & Bucket
Factory, Fancy Bazar,
Gauhati.

9. Shyam Steel Construction,
Co., Sanchoa, Nowgong.

(10) Tinsukia Steel and Wire
Manufacturing Co.,
Udyognagar, Tinsukia.

(11) K. C. Trunck & Bucket
Factory, Gauhati, Fatashil.

(12) Wazir Ali
C/o The Depot Supdt.,
B.O.C. (I.T.) Ltd.,
Badarpurghat,
Dist. Cachar.

MAHARASHTRA (4)

The list of manufacturers of Weights and Measures in Maharashtra State published in Metric Measures of November 1960, January 1961 and January 1962 stands cancelled. The following is a complete and revised list of manufacturers licensed under the Bombay Weights and Measures Enforcement Act, 1958 in the State of Maharashtra:

Manufacturers

Sl. No.	Name and Address of the Manufacturer	Details of Articles manufactured.
(1)	Abbasbhai Yusufali Dohadwala, Sunder Galli, Near Hanuman Mandir, Hains Road, Byculla, Bombay-11.	Conical (Litre) Measures.
(2)	Avery Company of India (Private) Ltd., 16, Dougal Road, Ballard Estate, Bombay-1.	Weights, Measures, Weighing and Measuring Instruments.
(3)	Associated Commercial Mfg. Enterprises (Private) Ltd., Janmabhoomi Chambers, 29, Fort Street, P.B. No. 1895, Bombay-1.	Measuring Instruments (Hand Operated Petrol Pumps.
(4)	Adarsh Engineering Private Ltd., Shivaji Road, P.O. Shrirampur, District Ahmedabad.	Weights.
(5)	V. S. Amberkar and Sons, 22-23, Mohamadi Market, Dr. Babasaheb Ambedkar Road, Lalbaug, Bombay-12.	Linear Wooden Measures.
(6)	A. Z. and Sons, 373, Bapty Road, Bombay-8	Conical (Litre) Measures.
(7)	Arvind and Suresh Engineering Works, Near Agaram Devi, Subash Road, Nagpur.	Cast Iron Weights.
(8)	Bharat Litre Mfg. Works, 43, Suleman Kasam Mitha Chawl, Round Gate, Duncan Road, Bombay-8.	Conical (Litre) Measures.
(9)	Bharat Scale Co., 200, Janjikar Street, Bombay-3 .. .	Beam Scale and Counter Machine.
(10)	Bansilal and Co., Main Road, Nasik City	Beam Scales.
(11)	Bharat Home Industries, C/o United Casting, E-2131, Vikram Nagar, Kolhapur.	Cast Iron Weights.
(12)	Bajarang Metal Works, Itwari Bazar, Nagpur-2	Brass Weights.
(13)	Behre Mullaji Shop, 'Street Lamp Works' Bhandara Road, Itwari, Nagpur.	Conical (Litre) Measures.
(14)	P. S. Banarse Industries, (India) Private Ltd., Badnera Road, Amravati.	Weights.
(15)	Central Metal and Wire Products, 60, Lamington Road, Opp. Maratha Mandir, Bombay-8.	Weights.
(16)	Chari's Scales, 6, Kalyan Building, 8, Khetwadi Lane, Bombay-4.	Beam Scale and Brass Weights.
(17)	Chawara Engineering Works, Balaghat Road, Gondia (S. E. Rly.).	Commercial Cast Iron Weight.
(18)	M. K. Chavan and Sons, Tiwandha, Nasik	Weights.
(19)	L. M. Chaudhary, 123, Gold Finch Peth, Sholapur ..	Weights.
(20)	Damle Iron Works, Baliram Peth, Jalgaon	Weights.
(21)	Dawoodbhai Kaderbhai, Tajna Peth, Akola . ..	Beam Scales
(22)	Ebrahim Mulla Abdultayeb, 69, Sarang Street, Bombay-3	Beam Scales and Counter Machines.
(23)	Esaji Gulamhussain, 203, Janjikar Street, Bombay-3	Beam Scales and Counter Machines and Brass Weights.
(24)	Everest Tapes, Swastik House, Block No. 7, 382, Lamington Road, Bombay.	Measuring Tapes.
(25)	Fidali Gulamali, 163, Janjikar Street, Bombay-3	Beam Scale and Counter Machine.
(26)	C. P. Foundry Works, Kamptee Road, Pilinadi, P.O. Bezonbagh, Nagpur.	Weights and Measures.
(27)	Fakruddin Abdulhusain, 72, Bapti Road, Mirza Chawl, Bombay-3.	Conical (Litre) Measures.

Manufacturers (*Contd.*)

Sl. No.	Name and Address of the Manufacturer	Details of Articles manufactured
(28)	Gothi Iron and Metal Works Ltd., Shingada Tank, Nasik	Weights.
(29)	Ganesh and Co., 24, 1st Pathan Street, Bombay-4 .	Weights.
(30)	Hindustan Scale Co., 186-88 Janjikar Street, Bombay-3	Beam Scales and Counter Machines.
(31)	Hind Litres Manufacturer, 25/9, Kazipura Bombay-8 ..	Conical (Litre) Measure.
(32)	Hakamchandishwardas, 167, Gurwar Peth, Poona-2 .	Conical (Litre) Measure.
(33)	Imperial Iron Works, 6th Kumbharwada, Kharwa Galley, Bombay-4.	Weights.
(34)	Jayashree Metal Corporation, Kumbharwada Cross Lane, D'Souza Street, Vadgadi, Bombay-3.	Weights.
(35)	A. A. Katawala, 194, Janjikar Street, Nimakwala Building, Bombay-3.	Beam Scales and Counter Machines
(36)	Khandelwal Udyog, Khandelwal Bhawan, 166, Dr. Dadabhai Naoroji Road, Fort, Bombay.	Commercial C. I. Weights.
(37)	Kolte Engineering Workshop Bargaon Road, Wardha	Weights.
(38)	Krishna Co., 738, Shukrawar Peth, Poona-2 ..	Weights.
(39)	Laxmi Engineering Works, 197, Corner of Grant Road, Bombay-8.	Weights
(40)	Lullubhai Amichand Private Ltd., 48/50 Kansara Chawl, Bombay-2.	Conical (Litre) Measures.
(41)	Larsen and Toubro Ltd., I.C. House, Dougall Road, Ballard Estate, P.B. 278, Bombay-1.	Measuring Instruments (Petrol Pumps).
(42)	Libra Industries, 10, Sussex Road, Byculla, Bombay-27	Weighing Instruments.
(43)	Luhar Rana Trikam Marwane, 4th Kumbharwada, Dadabhai Parsi Chawl, Shop No.1, Bombay-4.	Weights and Beam Scales, Linear Measures.
(44)	Mehta Boghani Metal Works, Devkaran Nanji Bldg., 17-B, Horniman Circle, 3rd Floor, Fort. Bombay. .	Weights.
(45)	Munshi Sufi, 154, Janjikar Street, Bombay-3	Conical (Litre) Measures.
(46)	Mohd. Siddik Tinwala, 94, Ripon Road, Ramzan Building Bombay-11.	Conical (Litre) Measures.
(47)	Mohd. Farooq Gallenwalla, Khetwadi, Meher Bazar, Bombay-4.	Concil (Litre) Measures.
(48)	Mercantile and Industrial Development Co., Private Ltd., National House, 6, Tulloch Road, Apollo Bunder, Bombay-1.	Measuring Instruments (Petrol Pumps) Etc.
(49)	Mansukhlal Narandas, Chandwadkar Lane, Nasik City	Weights.
(50)	A.M. Master and Co., 179/81 Janjikar Street, Bombay	Beam Scales and Counter Machines.
(51)	Mulji V. Narsi, Udyognagar, Sion, Bombay-22	Weighing Instruments (Counter Machines).
(52)	N. J. Mehta and Co., 10, Keshavji Road, Old Chinch Bunder Road, Laxmi Niwas, Bombay-9.	Beam Scales.
(53)	Murcury Iron and Steel Co., Private Ltd., Engineers Founder and contractors, Globe Mills Passage Cross Lane, Bombay-13.	Cast Iron weights.
(54)	Mistilal Motilal, 71, Sarang Street, Bombay-3 . ..	Beam Scales and Counter Machines. Linear Measures.
(55)	Mulji Lakhmidas and Co., 193, Janjikar Street, Cutlery Bazar, Bombay-33.	Beam Scales and Counter Machines.
(56)	M.R. Metal Work, Building No. 9-10-14, Chamar Lane, Room No. 19, Bycullax, Bombay-27.	Brass Weights.
(57)	Modern Foundry and Machine Works Ltd., Station Road, Ahmednagar.	Weights.
(58)	Mistry Ramji Devji Katewala, Tajna Peth, Akola .. —	Beam Scales.

Manufacturers (*Contd.*)

Sl. No.	Name and Address of Manufacturer	Details of Articles Manufactured
(59)	Mohamed Ismail Tin Factory, Near O.S. Mills Compound, Water Tank, Nanded.	Conical (Litre) Measures.
(60)	Misrilal Motilal, Rangraj Lane, Chowk, Aurangabad ..	Beam Scales.
(61)	National Metal Industries, 15-A, Parel Village Road, Bombay-8.	Weights & Measures.
(62)	M. Nazir and Sons, Haji Kasam Chawal, Duncan Road, Cross Lane, Bombay.	Weights & Weighing Instrumen
(63)	Nadirshaw and Bros, Silver Talkies Building, Khetwadi Back Road, Bombay-4.	Cast Iron Weights.
(64)	M.M. Nasib, 18/2 Kamathipura, Bombay-8	Conical (Litre) Measures.
(65)	National Scale Traders, 199, Janjikar Street, Bombay-3	Beam Scales and Counter Machines.
(66)	New Honesty Engineering Works Pelodia Manzil, Dimtimkar Road, New Nagpada, Bombay-8.	Counter Machines.
(67)	Oriental Metal Pressing Works, Private Ltd., 131, Worli, Bombay-18.	Weights & Measures.
(68)	Pas Tin Works, Haji Cassum Chawl No. 29, Shop No.11, Small Kazipura, Two Tanks, Bombay-8.	Conical (Litre) Measures.
(69)	Patil Iron and Brass Works, Panchavati, Nasik	Weights.
(70)	Parvat Revji Mistry, Malegaon Motor Stand, Panchavati, Nasik,	Beam Scales.
(71)	Patel Industries, Mhasrul Tek, Old Tambat Lane, Nasik	Weights.
(72)	Prabhat Foundry, 689, Sadashiv Peth, Poona-2	Commercial C.I. Weights.
(73)	S.M. Phatatye, 262, Chatti Galli, Sholapur	Beam Scale Linear Measure.
(74)	Pimple Mechanical Works, Bassim Motor Stand, Akola (M.S.) ..	Weights.
(75)	Ram Mills Ltd., Fergusson Road, Parel, Bombay-13	Weights.
(76)	Ripon Road Iron Foundry, Lamington Road, North Allana Compound, Opp. Agripada Police Station, Bombay-11.	Weights.
(77)	Rajabali Abdulhusain Tinwala, 1st Parsiwada, Vithalbhai Patel Road, Bombay-4.	Conical (Litre) Measures.
(78)	Reliable Iron and Mechanical Works, Pipe Line, Vakola, Santacruz, Bombay-55.	Weights.
(79)	Rajkamal Scale Co., 154, Janjikar Street, Nimakwala Building, Bombay-3.	Beam Scales and Counter Machines and Brass Weights.
(80)	V.D. Rojani, 142, Upper Duncan Road, Bombay-8 ..	Weights
(81)	Rajkamal Iron and Metal Works, Gandhinagar Road, Kopergaon, Taluka Kopergaon, Distt.	Commercial C. I. Weights.
(82)	Ravindra Works, Gandhi School Road, C, No. 2, New Shukrawari, Nagpur.	Commercial C.I. Weights.
(83)	Saple's Scale Manufacturing Private Ltd., 180-B. Gaiwadi, Girgaum Road, Bombay-4.	Weights and Weighing Instruments.
(84)	Steel Industries of Hindustan Private, Ltd., Magazine Street, Darukhana, Bombay-10.	Weights.
(85)	Siesta Industrial and Trading Corporation, Bail Bazar, North Kurla, Bombay-70	Cast Iron Weights.
(86)	Standard Mechanical and Iron Works, 197, Janjikar Street, Cutlery Bazar, Bombay-3.	Weights and Beam Scales and Counter Machines, Linear Measures.
(87)	Sarda Iron Industries, Opp. Nav Bharat Press, Ghat Road, Nagpur-2	Commercial C. I. Weights.
(88)	Snehal Trading Corporation, 49, Khoka Bazar, Bombay-3	Beam Scales and Counter Machines.
(89)	Sama and Juha United Works, Kopergaon Estate Compound, Love Lane, Shade No., 4, Byculla, Bombay.	Conical (Litre) Measures.

Manufacturers (*Contd.*)

Sl. No.	Name and Address of the Manufacturer	Details of Articles Manufactured
(90)	B. G. Shinde and Co., 735, Shukrawar Peth, Poona-2	Weights, Weighing Instruments Linear Measures.
(91)	Swastik Iron Works, Ghat Road, Nagpur-2 ..	Weights.
(92)	Tahira Industries (India) Private Ltd., 19/21, Manohardas Street, Bombay-1. ..	Measuring Instruments (Petrol Pumps)
(93)	Union Metal Works, 14-D, Kurla Industrial Estate, Near Mahindra and Mahinda Std., Agra Road, Ghatkopar, Bombay-77.	Weights and Measures.
(94)	D.L. Vaid, 202, Cutlery Bazar, Bombay-3 . ..	Brass and Bullion Weights and Beam Scales and Counter Machines.
(95)	Victory Industries, 215-A Ripon Road, Bombay-8 .	Conical (Litre) Measures.
(96)	Vidarbha Engineering Industries, Abhayankar Road, Sitabuldi, Nagpur-1.	Weights.
(97)	G. B. Wagh and Co., Laxmi Bhuwan, 547, Delisle Road, Bombay-11.	Counter Machines.
(98)	Wafadar Metal Industries, 446-E, Shahupuri, Kolhapur	Commercial Cast Iron Weights.
(99)	Yande Iron Works, 268, Sadashiv Peth, Poona-2	Cast Iron Weights.
(100)	Y. M. G. Industrial Works, 2015, Yeshpushpa Rajarampuri 6th Lane, Kolhapur.	Cast Iron Weights.
(101)	Zenith Textile Engineering Co., 250, Ripon Road, Bombay-8.	Weights.

MYSORE (5)

In the March, May and November 1960 and May 1961 issues of Metric Measures lists of licensed manufacturers, dealers and repairers of weights and measures in Mysore State were published. The following is a list of manufacturers, dealers and repairers subsequently licensed by the Government of Mysore under the Mysore Weights and Measures (Enforcement) Act, 1958.

Manufacturers

Sl. No.	Name and address of manufacturer	Details of articles manufactured
(1)	Aryavart Engineering Works, Khairnagar, Meerut, U.P.	Commercial Weights Measures, Weighing and Measuring Instruments.
(2)	Adabala Sayanarayana & Sons, Dowlaishwaram, Port, East Godavari, Andhra Pradesh.	Beam Scales.
(3)	Associated Scales Industries, Tara Bhavan Station Road, Savarkundla.	Beam Scales.
(4)	Dey's Weighing Scales & Engineering Works, 223, Belihos Road Howrah, West Bengal.	Weighing Instruments excluding Beam scales
(5)	Elseetee Industries, Opp. Central Studio Ltd., Trichy Road, Singanallapur, Coimbatore-5.	Weights & Weighing Instruments.
(6)	Eastern Scales (P) Ltd., 12, Gurusaday Road, Calcutta-19	Weighing Instruments.
(7)	C. P. Foundry Works, Kamptee Road, Pilinadi , P.O. Bezonbagh, Nagpur-4.	Weights & Measures.
(8)	A. Gurunath, 15, Strangers Street, Madras-1	Weights, Measures, Weighing and Measuring Instruments.
(9)	Gopal Prasad & Sons, 887, Baral Bhai Street, Belanganj, Agra.	Cast Iron & Brass Weights.

Manufacturers *(Contd.)*

Sl. No.	Name and Address of the Manufacturer	Details of Articles Manufactured
(10)	Hilal Consumer Goods, 14-4-270 Joshiwadi , Begum Bazar, Hyderabad, A.P.	Litre Measures.
(11)	Jain Industries, Naiki Mandi, Agra	Cast Iron Brass & Bullion Weights of all denominations.
(12)	E. G. Katawala, 203, Cutlary Bazar, Bombay-3 .. .	Beam Scales & Counter Machines.
(13)	Krone Industries, No. 6, 5th Cross Cubbonpet, Bangalore-2.	Linear Measuring Metres and Half Metres.
(14)	B. B. Lahoti, Hardware Merchant, Jamkhandi, Bijapur Distt.	Linear Measuring Metres and Half Metres.
(15)	Lallubhe Amirchand (P) Ltd., 225/29, Tardeo Road, Bombay-7.	Cylindrical (Capacity) Measures.
(16)	Marwadi Moulding Factory, Kasarhatta Road, Hyderabad-3	Cylindrical dipping Type Measures.
(17)	Mehta Brothers, 1827-1 2nd Cross Road, Melleshwaram, Bangalore-3.	Linear Measuring Metres and Half Metres.
(18)	Mighty Scale Company, Kuranchari, Hadakanchari, (Cochin).	Platform Machines
(19)	Mulji V. Narsi Metal Pressing & General Engineering Works, Udhyognagar, Sion, Bombay-22.	Counter Machines.
(20)	Poineer Electric Corporation, 53, Vijai Nagar, Colony, Agra.	Brass, Bullion and Cylindrical Weights
(21)	Prathibha Industries, 163, North Vijai Nagar Colony, Agra.	Commercial & Bullion Weights.
(22)	Rajkamal Scale Company, 154, Janjikar Street, Bombay	1. Beam Scales Class B.C. & D. 2. Counter Mechines. 3. Linear Measures.
(23)	Sangameshwar Engineering Works, Station Road, Gadag	1. Beam Scales Class 'C'. 2. Counter Balance. 3. Linear Measuring Metre and half Metre.
(24)	P. Sheshachalam & Bros., No. 26, Nethaji Subhas Chandra Bose Road, Madras.	Weights.
(25)	Shanta Fijaya Chin Factory, Pandya Street, Savarkundla (Gujarat).	Beam Scales.
(26)	Star Metal Works, Begum Bazar, Hyderabad . .	Litre Measures.
(27)	Swastik Metal Works, G. T. Road, Shahdra, Delhi-32	Cylindrical capacity Measures.
(28)	L. C. Thakkar, Hukal Sal, Hubli	Linear Measuring Metre and Half Metre.
(29)	D. L. Vaid, 202, Cutlery Bazar, Bombay-3	Brass and Bullion Weights & Beam Scales of Class B.C.D. & Counter Machines.

DEALERS OF WEIGHTS AND MEASURES, WEIGHING AND MEASURING INSTRUMENTS

(1) Aspinwall & Co , Ltd.,
P. B. No. 19, Mangalore.

(2) Asha Trading Company,
130, Avenue Road,
Bangalore.

(3) B. C. Angadi,
Brass, Copper & Hardware Merchant,
Bailhongal,
Bijapur, District.

(4) V. Alimeda,
Dealer in Weights & Measures,
Subhas Road, Dharwar.

(5) Bhimeenappa & Bros.,
General Merchant,
Harpanahalli.

(6) Bajpe Enterprises, 41/2, St. John's Church Road, Bangalore-1.

(7) Brothers Stores,
Main Road, Kollegali.

(8) Buddappa,
S/o Thippaiah.,
C/o Jon Mahmed,
Old Myderwadi Road,
Shop No. 11-2-100, Raichur.

Dealers *(Contd.)*

(9) Chidambaram Stores,
8th Cross, Temple Road,
Malleswaram, Bangalore.

(10) Chandran & Co.,
Post Office Road,
Mercaral.

(11) Chandarana Brothers,
Mission Street,
Mangalore.

(12) General Industrial & Engineering Co.,
No. 6 Sri Narasimharaja Road,
Bangalore-2.

(13) M.G. Gaikwad,
Mahaveer Road, Bijapur.

(14) G. Guddappa,
General Merchant,
C/o Mallanna, Chitradurga Road,
Davangere.

(15) Gautham Stores,
Hardware & General Merchants,
H-121, Yerrappa Block, Srirampur,
Bangalore-21.

(16) G. R. Honakalse & Sons,
Contractor, Main Road, Bijapur.

(17) Hon. Secretary,
Sharof Association,
Thambakpet,
Davangere.

(18) K. S. Hussain Sahib,
Modern Bedding Stores &
Cycle Mart, New Market,
Robertsonpet, K.G.T.

(19) R. K. Haje Abdul Hakh,
Hardware & General Merchant,
M. G. Road,
Chikmagalore.

(20) M. N. Hussen & Co., (Bangalore)
127/A Commercial Street,
Bangalore-1.

(21) S. M. Kichiah Setty,
Prop : Sri Rama Narayana Stores,
G.T. Street,
Kolar.

(22) A. R. Kandagal,
C/o O G.D. Teli Venkatapeth,
Bagalkot.

(23) Kolkars Metal Ware,
Car Street,
Udipi.

(24) Kalappa Bhemappa Kutte,
Bazar Road, Bailhongal,
District Belgaum.

(25) Kanaka General Stores,
Hardware & Paints Merchants,
T. Narasipur.

(26) C. G. Kudathine,
Hardware Merchants,
Kushtagi, Raichur District.

(27) Lal Mohamed Sagardaranja,
Yadgir, Gulbarga District.

(28) N. Lakshmaiah Setty & Sons,
Hardware Merchants,
M. G. Road,
Chennapatna.

(29) Mathai V. Poovan,
Hardware Merchants,
Sidapur, Coorg.

(30) Mangalore Estate Supplies,
General Hardware Merchants,
Mudigere, Chikmagalore Dist.

(31) Mahabub Saheb Mujawar,
General Merchant,
Market Road,
Bailhongal,
Belgaum District.

(32) Mysore Coffee Curing
Work Ltd., Chikmagalur.

(33) Mysore Pieces Goods,
Merchants Association,
Soji Street, Mysore.

(34) B. Muniswamyachar,
C. T. Street, Nagaratapet,
Bangalore-2.

(35) M. L. Manjiah Setty & Sons,
Merchants, P. B. No. 3,
Chikmagalore.

(36) Navajivan Stores,
Main Road,
Bantawala (S K.)

(37) C. Narayana Chowdry,
C/o. Caltex Agents,
Bangalore Road, Bellary.

(38) National Industries,
Poona, Bangalore Road,
Davangere.

(39) Nagappa, S/o Mallayya,
Near Hanuman Talkies,
Raichur.

(40) Nagaraja Setty,
Prop : Vinayaka Stores,
General Merchant, Hosadurga.

(41) M. H. Naik & Brothers,
Weights & Measures Dealers,
Davangere.

(42) B. Nanjunda Setty & Sons,
S.V.O.C. Agents & Merchants,
Nelamangala P.O.

(43) Orient Traders,
No 1003/B Benke Nawab Street,
Mandi Mohalla, Mysore.

(44) K. Panduranga Vasudeva Kudva,
Panemangalore, S.K.

(45) Paruthi, C/o Panchaxary
Shadaksarimath, Gajipur,
Gulbarga.

(46) F. Raja & Co.,
20, Godown Street,
Bangalore-2.

Dealers *(Contd.)*

(47) Ramaiah Setty,
Prop : Sri Ganapathi Stores,
Tiptur.

(48) P. Shanthappa,
Hardware Merchant,
Vijayalaxmi Road,
Davangere City.

(49) P. A. Siddappa & Sons,
General Merchant,
1st Cross Road, Robertsonpet,
K.G.F.

(50) G. B. Sreevarma & Sons,
Iron, Hardware & Paint Merchant,
Ashok Road,
Mysore

(51) M. Srinivasa Charlu & Co.,
P. B. No. 542,
28, Sri Narasimharaja Road,
Bangalore.

(52) Subbiah Setty & Sons,
B. 45, New Tharagupet,
Bangalore-2.

(53) Salar Masood Saheb & Sons,
Hardware & Paint Merchant,
Ashoka Road, Mysore.

(54) Sharanappanavar,
Copper, Brass & Hardware Merchant,
Bailhongal,
Belgaum District.

(55) Sha Misrimal Babulal & Co.,
Gandhi Bazaar, Shimoga.

(56) Shivabasava Stores,
Prop: Chandrashekarpa,
Anabasapa Nelovegi,
Hardware Merchant,
Gandhi Road, Haveri.

(57) Sivapuram Rangaiah Setty & Sons,
Car Street,
Bellary.

(58) Sugar Chemical & Fertilisers,
Market Road, Sagar.

(59) Sunrise Industries,
5th Main Road,
Sriramapuram, Bangalore.

(60) Syed Jamaludding,
C/o K. M. Motor Service,
Mosa Saheb, Bangalore Road,
Bellary District.

(61) Thibbadevi Grainage,
Prop : Thammiah Gowda,
Chamarajanagar.

(62) K. Teerthappa,
General Merchant, Lingsugar,
(Chavani).

(63) K. Thimmaiah,
S/o Laxmaiah,
C/o Tuka Tikkanna,
Kirana Shop, Thimmapurpeth,
Raichur.

(64) A. V. Thomas & Co., India Ltd.,
10, Richmond Road,
Bangalore.

(65) B. Vajrappa,
Hardware Merchant,
Good-shed Road,
Davangere.

(66) Venkata Swamy & Sons,
Hosamane Extension,
Shimoga.

(67) Virupanapa Basvantapa,
Uppin, General Merchant,
Sureban, Ramdurg,
District Belgaum.

(68) Volety Venkataramaiah
Setty & Sons, Sidlagatta,
Kolar District.

(69) Vithalji & Company,
Bunder Road, P. B. No. 7,
Mangalore.

(70) Volkart Brothers,
Coffee Curing Works,
P. O. Box 12, Mangalore-1.

(71) R. Veerabadraiah & Bros.,
C/o Jayadeva Hostal,
Chitradurga.

(72) Willam D' Sauza,
Copper & Brass Merchant,
Dodapet, Malavally,
Mandya District.

REPAIRERS OF WEIGHTS AND MEASURES AND WEIGHING AND MEASURING INSTRUMENTS

Repairers

(1) Almedia Engineering,
Subhas Road, Dharwar.

(2) K. Abdul Wahab Scales,
Repairing Workshop,
131, Chandni Chowk Road,
Bangalore.

(3) M. D. Amir Ali Maniyar,
Ganj Road, Gulbarga.

(4) Bajpe Enterprises,
24/A St. John's Church Road,
Bangalore-1

(5) Bharat Engineering Works,
Main Road, Puttur (S.K.)

(6) Gurupadappa Sogirappa,
Laxmeshwar, Hattikal-sal,
Hubli.

Repairers (*Contd.*)

(7) Jai Hind Vegetable Stall, and Jain Hanuman Cycles, Chikpet, Mercara.

(8) T. T. M. Kotrabasaiah, Merchant, P.O. Hamsagar *via* Hospet, Bellary District.

(9) Karnatak Iron, Works, 29/1 Sri Jayachamarajendra Road, Bangalore-2.

(10) S. M. Khadanpur, Hattikal-sal, Hubli.

(11) Kanara Scales Centre, No. 41, Aga Abdulla Street, Richmond Town, Bangalore-1.

(12) M. Krishna Swamy Mysore State Scale Service, No. 1567, 3, Nagappa Block, Bangalore-21.

(13) Krone Industries, Prop : Mir Noorul Hussain, C/13, New Bamboo Bazar Road, Bangalore-2.

(14) Madar Rajesab Mulla, Gokak Falls, Bellary.

(15) Mehta Brothers, 1827/1, 2nd Cross, Malleswaram, Bangalore.

(16) M. H. Naik Brothers, Repairing Workshop, Jubeleepet, Davangee.

(17) National Iron Industries, No 7, Matinagar, Bangalore

(18) N. S. Paruthi Repairing Workshop, Gajipur, Gulbarga.

(19) Saijoo & Co., 67, Old Bamboo Bazaar Road, Bangalore.

(20) Sangameshwar Repairing Works, Prop : M V. Punganur. Savanur, Dharwar District.

(21) N. Srikantaiah & Sons, 42-A, Cemetry Road, Bangalore.

(22) Syed Ahmed Works, D. No 66/4 Old Bether Road, Davangere.

(23) Uberai Trading Co, No. 26/1 Lalbagh Road, Bangalore-1.

(24) Venkateswar Scale Repairer, Prop : Sri K. Thimmaiah, Mohialla Machivadi, Raichur.

PUNJAB (13)

In the July and September, 1959, March, May, July, September and November, 1960 and March, May, July, November, 1961 and January 1962 issues of Metric Measures lists of manufacturers, dealers and repairers of Weights and Measures in Punjab State were published. The following is a list of manufacturers and dealers subsequently licensed by the Government of Punjab under the Weights & Measures (Enforcement) Act, 1958.

Manufacturers

(1) Mittal Industrial Corporation, Kessar Ganj Road, Ludhiana.

(2) Popular Industries, Main Road, Banga (Jullundur).

Dealers

(1) Bali Ram Nobat Rai, Main Bazar, Moga.

(2) Beni Mal Puran Chand, Mandi Bazar, Faridkot.

(3) Diwan Chand Waryam Chand, G. T. Road, Karnal.

(4) Ram Chander Verma S/o Bhola Ram Verma, Rohtak.

(5) Ram Gyaneshawar Dass, Bazaar Sarai Chopta, Bhiwani.

(6) Sadhu Ram Banwari Lal, Pilu Khera (Sangrur).

Repairers

(1) Harbans Tank Engineering Works, Gurdaspur Road, Pathankot.

(2) Indian Scale Industries, Kali Bari Road, Ambala Cantt.

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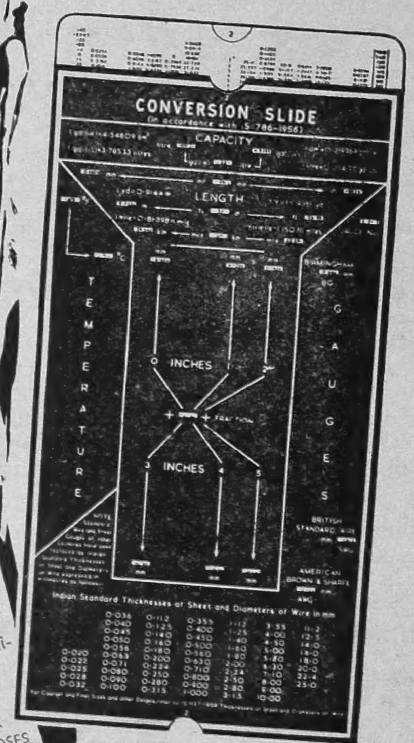

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